

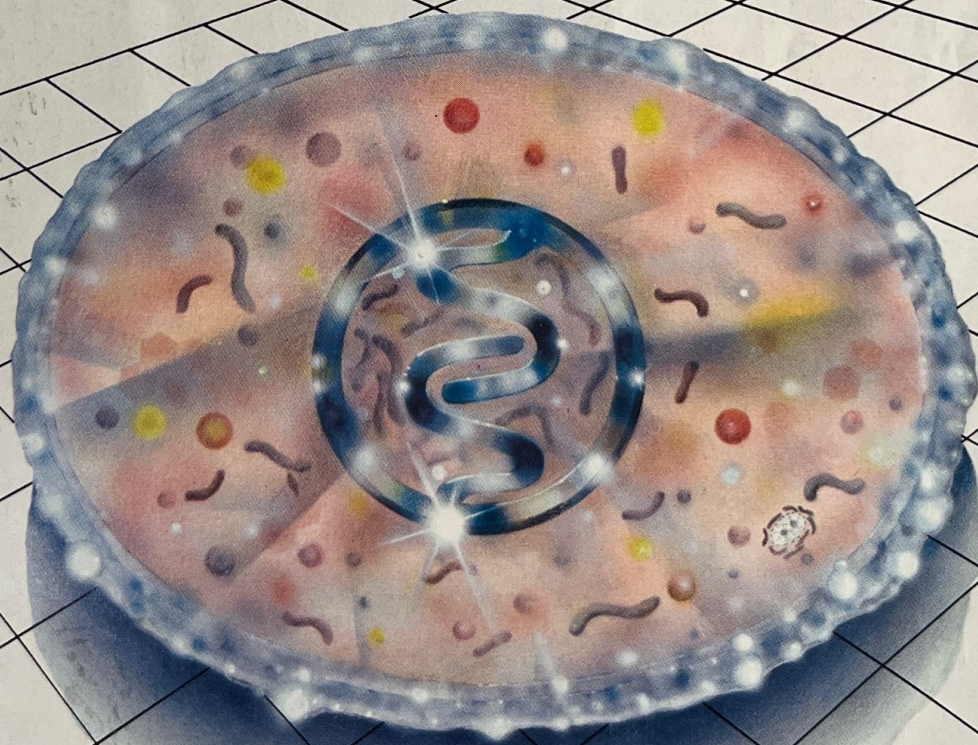
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The Monthly Magazine For Sanyo Personal Computer Users

Life On The Sanyo

A New Look At An Old Favorite

- **Creating Graphic Screen Dumps With A Daisy Wheel Printer**
- **Cross-Referencing Your BASIC Program Variables**
- **Constructing A 'Fix' For The 555's Power Supply**



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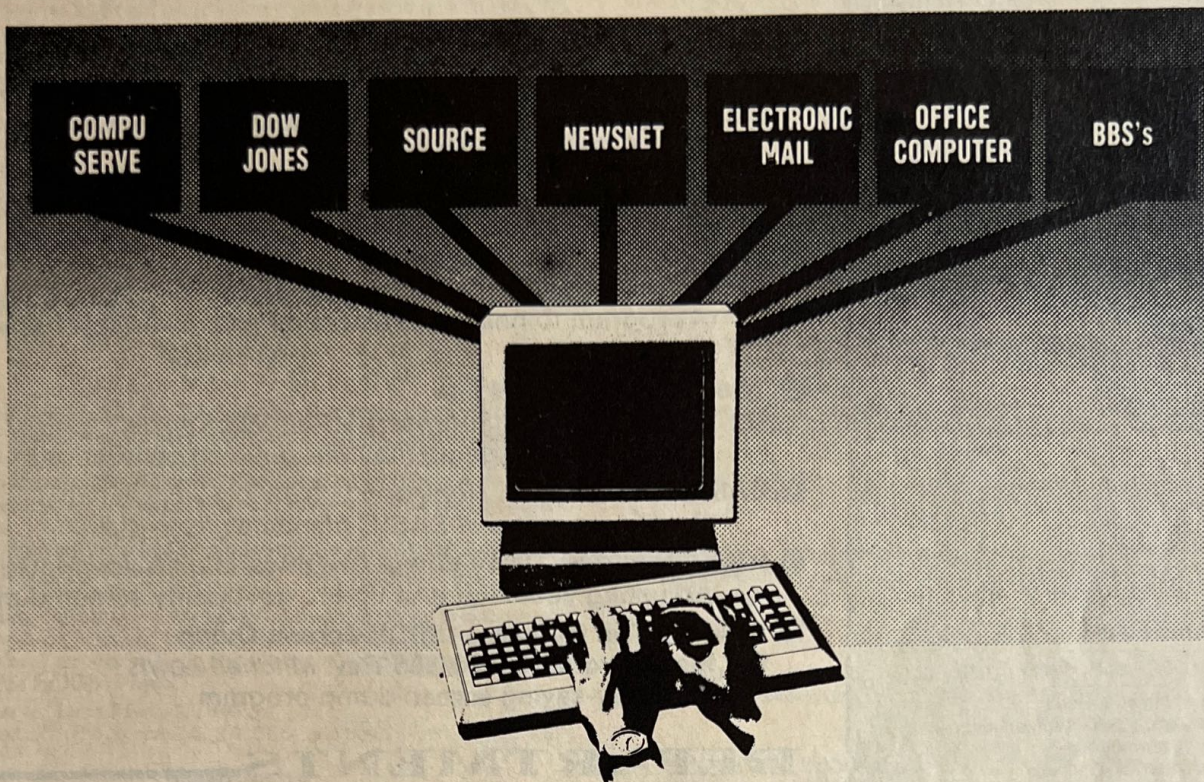
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The Monthly Magazine for
Sanyo Personal Computer Users

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October 1985

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- The small disk symbols appearing beside features and regular columns indicate that the program listings with those articles are on this month's **SOFT SECTOR ON DISK**, ready to LOAD and RUN. For full details, see the **SOFT SECTOR ON DISK** ad on Page 55.

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- Still the only text dump for 2.11 automatically transferred via FORMAT /S.
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- A-OK DOS system messages are easier to understand.
- Supports up to 4 disk drives.

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Soft Sector sums it up well in their review entitled "A-OK DOS and PrintScreen550—An Unbeatable Combination."

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LETTERS TO THE EDITOR

PARTS IS PARTS

Editor:

We at St. Mary's Church are long time users of Sanyo computers, and we could not exist without your magazine. The information we obtain from it just cannot be measured.

Take for example your article "Making the Switch To The Video Board" (SOFT SECTOR, June '85, Page 17), which is a very helpful bit of information. I have installed the switch and it works extremely well. You might want, however, to correct one part of the article.

One of the parts needed there was listed one #15-1539 VCR Video/Audio Cable(s). Radio Shack does not have this part anymore, and I purchased two #42-2368, 3.6, 12-inch Shielded HI FI Cables instead, at \$3.09 each which have worked out perfectly.

I am sure your readers will be very happy with this set up for monochrome monitors.

*Bud Buescher
Parish Secretary
Bloomington, IL*

DOUBLE DRIVE

Editor:

I recently attempted to upgrade my MBC-550 by adding a second disk drive. The second drive is identical to the original drive, a TEAC Model FD-54A-00-U 160K single-sided. After following the instructions in the *Sanyo Operator's Guide* to the letter, I was more than a little disappointed to find that the drives would not work satisfactorily. Obviously some vital instruction is missing from the handbook because when connected separately, both drives work perfectly, but when both are connected at the same time, both drives run simultaneously. Upon studying the plugs to the two drives, it appears that they are connected in parallel so perhaps the results I am getting are not really so surprising. Rather than begin experimenting and risk wrecking both drives, I would be most grateful if you would let me into the secret.

May I offer my congratulations on an excellent publication which I read from cover to cover. The prices of the articles in the advertisements almost make me weep;

about one third of what we must pay here in New Zealand.

Thanking you in anticipation, and very best wishes for the future of SOFT SECTOR.

*G. Lacey
Masterton, New Zealand*

Editor's Note:

This question was sent to John Kelty, author of "TEAC FD-54A LED Modification" (SOFT SECTOR, April '85, Page 88), for a reply.

Dear G. Lacey:

I received your letter from the SOFT SECTOR managing editor. After reading it about halfway through, it occurred to me that your problem with the disk drives may be too simple. If you followed the Sanyo manual to the letter, which it seems that you did, it does not mention the drive select jumpers. You must use DS0 for drive A and DS1 for drive B. The clue in your letter that suggests this is your problem, is when you state that "either drive works by itself." If one of the drives is selected as DS1 (drive B), then you should not be able to boot up the system with this drive. The diskette will rotate, but the light should not come on and no data should be read from it.

You will also notice that there are DS2 and DS3 selection jumpers. These are for drive C and drive D if you ever add any external drives to your Sanyo. I hope that this has solved your problems. Please contact me or SOFT SECTOR if you continue to have problems with upgrading your system drives.

*John R. Kelty
Lincoln, NE*

SHOW AND TELL

Editor:

This letter is in response to a letter which ran in SOFT SECTOR September '85, pertaining to my article "Putting The Hidden Files Where You Can Find Them." The reader stated that it was misleading to say that once a hidden file is made visible, it can be loaded into DEBUG. What I said was, "once a hidden file is made visible, it can be loaded into DEBUG and modified," and by modified I mean the file on disk.

Actually, SHOW.COM does more than just make the files visible. The attribute byte for IO.SYS and MSDOS.SYS in the disk directory contains a 7, which means the three least significant bits are on and indicates that they are read only, hidden, and system files. Attempting to write to these files will only result in an error message. SHOW.COM changes the attribute byte to 0 and the files

PAR
AVION

can now be loaded into DEBUG, modified, and the changes written to disk. HIDE.COM will then change the attribute byte back to 7.

Ray C. Robinson
Lake Charles, LA

REINSTATING COLOR

Editor:

I tried the *BlitzStar* (SOFT SECTOR, August '85, Page 44) patch in combination with a RAM Disk and was pleasurably amazed at the speed of updating the screen. However, Mr. Annis did not mention that one would lose the reverse video format on the messages. This is a small price to pay, but it does make blocking more difficult. As I would like to have my cake and eat it too, perhaps Mr. Annis could suggest a way of restoring the reverse video messages without sacrificing speed.

Paul Fuchs
Flanders, NJ

Editor's Note:
See below.

Editor:

The *WordStar* patch contained in the program *BlitzStar* by Charles Annis (August '85, Page 44) is a real time saver. However, I was disappointed to see that the patched program displays both the menu and text in the same color. Not satisfied with a monochrome *WordStar*, I did a little disassembling of my own. I found a *WordStar* internal flag at Location 2B3 Hex which, when changed to FF Hex restores the multicolor display. Furthermore, the menu colors are stored in 284 Hex and the text colors are in 28B Hex. In each of these offsets, the upper four bits represent the background color and the lower four bits represent the foreground color. By changing these manually, Video RAM Board users can take advantage of all of the board's 16 colors.

Herb Martello
Whiteford, MD

A SYSTEM SWITCH

Editor:

Recently, I purchased *Media Master* from DG/Systems in Woodland Hills, CA to convert several thousand lines of PASCAL source code for use on the MBC-555 from a Kaypro II. The program does not work 100 percent effectively, but I did discover a way around this which does allow text file transfer to work. I thought I would pass it on for anyone else needing to bring text files from a CP/M system to the MBC-555.

First, format a system disk on the MBC-555 with the format utility command:

FORMAT B: /1/S

Use the formatted disk as the destination disk on the CP/M system. Transfer a single file at a time from the CP/M disk to the MS-DOS disk. Do not use a wildcard for the copy as it seems to trash the directory in the process.

John L. Bluma, CDP
Meta, MO

LINE EDITING

Editor:

When writing a program in Sanyo BASIC Version 1.31, there is often a need to use the same or similar line construction in more than one place in the program. In the past, I was forced to re-input the line each time it was needed. The Sanyo screen editor provides a much easier way which does not seem to be documented in the book. Start by typing the line in once:

10 PRINT "THIS IS A TEST."

Hit the up arrow to get into the screen editor. Edit the line number from 10 to 15.

15 PRINT "THIS IS A TEST."

Hit BREAK and then LIST. When the program is listed, it will read:

10 PRINT "THIS IS A TEST."
15 PRINT "THIS IS A TEST."

The screen editor edits and copies your original line to the new location but does not remove the old line. Both of the lines can be edited as normal or reduplicated by editing the line numbers again. If there are intervening lines in the program the duplicated line will appear in its proper numerical order.

I hope that you find this "Helpful Hint" as useful as I do.

John R. Ducheck, Ph.D.
St. Louis, MO

NEW FORMATIONS

Editor:

I would like to inform anyone interested, that the Louisville, Ky. area has a Sanyo Users Group. Anyone wanting more information or wanting to join may write or call: Sanyo Users Group, 1616 Utica-Sellersburg Rd., Jeffersonville, IN 47130, (812) 282-2866.

Charles A. Haven
Jeffersonville, IN

Editor:

We are constantly adding other Sanyo SUGs to our mailing list in hopes of exchanging newsletters, etc.

Would you please note our address change. Our club was formerly listed as: Sanyos of Sarasota, Ernie Bontrager, 4047 Bee Ridge Road, Sarasota, FL 33582. Ernie is the owner of the local Sanyo dealership and started the club, but now it is operated independently of the store. Our new club name and address is: Sanyos of SaraMana (S.O.S.), 4411-100th Street West, Bradenton, FL 33507-1619.

Thanks for your help and sharing with us.

Bill Harrier
President
Bradenton, FL

Editor:

The MBC-550/555 Sanyo Club of France, has the pleasure of announcing our recent creation.

We have already gotten together several users of this machine. Our ambitions are numerous and diverse. We are trying to develop a system of hardware and software for this machine and get the most out of it that we can. Our address is: Sanyo-Club, 1, Rue de Clementville, 34000 Montpellier, France

Philippe Chardon
President
Montpellier, France

Editor:

We have finally managed to get a Sanyo Users Group started in the Cincinnati area. Please add our name to your list of active Sanyo User Groups. Cincinnati Sanyo User Group, Tim Mullen, 336 Miami Valley Drive, Loveland, Ohio 45140, (513) 831-6799.

Thank you for your help in this matter.

Tim Mullen
Loveland, OH

Editor:

The Tucson Sanyo Users Group is looking for new members. We meet the second Wednesday of the month at 7 P.M. Room 208, Geology Building, University of Arizona.

Persons wishing additional information may write: Julie Ingham, c/o Arizona Micro Exchange, 1927 E. Speedway, Tucson, AZ 85719 or call Bob Kalen (602) 742-0345 or myself (602) 721-9078.

Gene McKee
Tucson, AZ

Editor:

We have been selling the Sanyo MBC-550 series computers for one year now, and SOFT SECTOR for three months. We run a Bulletin Board during our off hours here at the store. I would like to let your readers know of our BBS and get the BBS added to your list. The hours are: 6 P.M. to 8 A.M. (Atlantic Standard) Our phone number is (902) 454-8344. Thank you.

Basic Computer Sales
Halifax, NS

SOFT SOAPBOX

Success is a very subjective state of being. Everyone has his own idea about what success is and how to achieve it. Success can be achieved through financial gain, through critical acclaim or even, in some instances, through scandal.

I like to think that SOFT SECTOR has achieved its success through critical acclaim from you, the reader. It's heartening to get letters from people who say they heard about SOFT SECTOR through a user's group or they saw a friend's copy of the magazine.

SOFT SECTOR's continued success allows us to continue to bring you new services. The way we find out what services you want is through your "critical acclaim;" for example, "I love your magazine and it meets most of my needs, but I would like to see. . . ."

One way we are trying to meet the needs of our readers is through telecomputing. Telecomputing is yet another way to get maximum use from your computer. It's a way of sending and receiving information, sharing your own personal programming tips and meeting people — some whose face you'll probably never even see.

Are you wondering what really practical uses you can get from telecomputing? How many times do you get your copy of SOFT SECTOR and want one of the programs in it *immediately*? Do you get up and go directly to your computer to type it in? Probably not. Now you can have that program

within a matter of minutes if you have the right equipment.

SOFT SECTOR programs are available through the CompuServe "Softex" service. You can download any of the programs found in the magazine if you have your own modem and terminal program. These programs are available for a nominal fee of \$5 each. To some of you, this may seem high. However, if you want the program *now* instead of four hours later (when you finish typing it in) or a week after you receive your magazine (if you order it on SOFT SECTOR ON DISK), it will be well worth the price.

Telecomputing on the major information networks is not only convenient, but also fun. It's fun because there are unlimited possibilities. There are several Special Interest Groups (SIGS) which include collaborative novels, joke SIGs, and things such as forums, which allow you to go online and ask questions and the like. Information networks can help keep you informed and up-to-date about what's going on in the computer world. Along with the special interest groups are shopping services, bulletin boards and a world of other resources — and it's available 24 hours a day!

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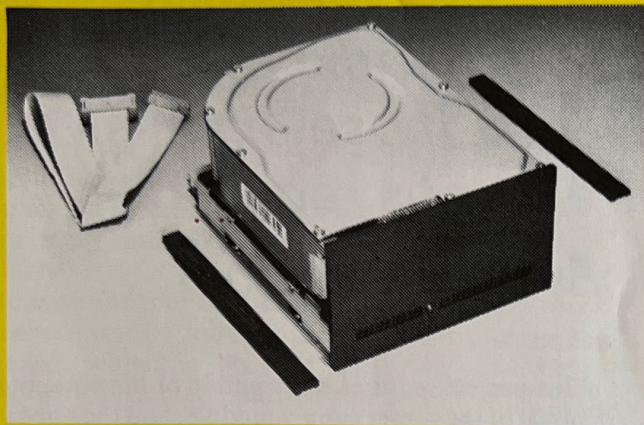
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Power Supply Upgrade

An inexpensive way to handle the power that those expensive add-ons require

By John Orlando III

With the advent of the Video RAM Board and the popularity of 8087 based software like Turbo PASCAL, the Sanyo MBC-555 owner may find his machine "dead" after the addition of these power-hungry hardware accessories.

Specifically, a 555-2 with 256K RAM, a Video RAM Board, an 8087 co-processor and a serial board may not "boot" after the addition of the final possible board or the IC chip because the power supply will shut itself down! This is because the power supply sensed a larger than "normal" current draw, assumed it was a "short" and turned off the DC voltage to prevent damage. This could be the case, but is probably not in machines that have just had every possible option installed.

The "problem" is just that the power supply sensing circuit component values were selected, based on a guess of what the current draw of the future Video RAM Board would be. It is not that the power supply cannot supply the needed power, but that the current is being limited by the sensing circuit!

The "fix" to this problem is quite simple for those of us who can wield a soldering iron, and it will cost us a whopping 58 cents (plus tax) for the parts! In fact, because the parts are sold at Radio Shack in packages of two, we can do two machines for 58 cents!

(John Orlando III is the director of engineering at Pocono Hospital in East Stroudsburg, Pa., as well as the owner of Effective Technologies, a consulting clinical engineering firm. He uses Sanyo computers at work, at home and in his business. John may be contacted at 1111 Mica Circle, Bethlehem, PA 18017; 215-691-2794.)

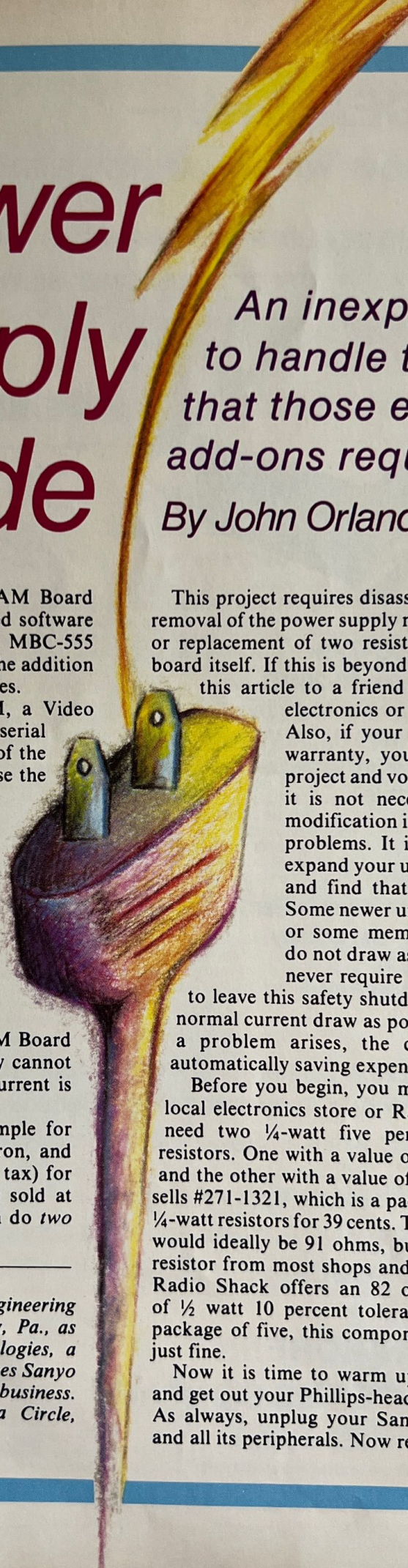
This project requires disassembly of the computer, removal of the power supply module, and the removal or replacement of two resistors soldered to the PC board itself. If this is beyond your capabilities, show

this article to a friend who happens to be in electronics or has de-soldered before! Also, if your computer is still under warranty, you had best not try this project and void the warranty. Finally, it is not necessary to perform this modification if you are not having any problems. It is only necessary if you expand your unit to its fullest capacity and find that it no longer operates. Some newer units, newer video boards or some memory/co-processor chips do not draw as much current, and will never require this upgrade. It is safer

to leave this safety shutdown current as close to normal current draw as possible, so that whenever a problem arises, the computer shuts down automatically saving expensive components.

Before you begin, you must take a trip to your local electronics store or Radio Shack. Ideally, we need two ¼-watt five percent tolerance carbon resistors. One with a value of 1,000 ohms (1K ohm) and the other with a value of 91 ohms. Radio Shack sells #271-1321, which is a package of two 1,000 ohm ¼-watt resistors for 39 cents. The other resistor needed would ideally be 91 ohms, but this is an uncommon resistor from most shops and really not that critical. Radio Shack offers an 82 ohm resistor (#271-011) of ½ watt 10 percent tolerance. At 19 cents for a package of five, this component will suit our needs just fine.

Now it is time to warm up your soldering pencil and get out your Phillips-head screwdriver collection. As always, unplug your Sanyo from its AC power and all its peripherals. Now remove the cabinet cover



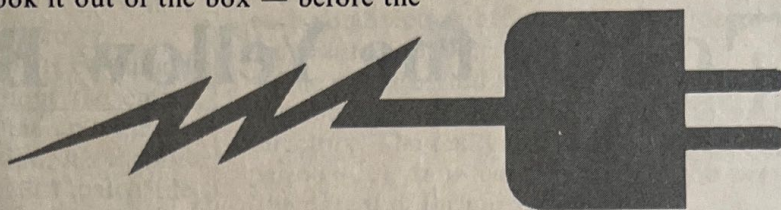
by removing the five Phillips-head screws as shown in the back of your user's manual.

- 1) Remove the two sets of cables (power and signal) that attach to the rear of the disk drives.
- 2) Remove the four Phillips-head screws that hold the floppy drive plate (on which both drives are mounted) from the main chassis. Note that the two screws on the power switch side also mount wire ties.
- 3) Remove the ground wire from the drive plate and slide the drives out toward the rear of the computer and place in a safe place.
- 4) Remove the four wire cables attached to the power supply board, which is between the power transformer and the fan on the bottom chassis.
- 5) Finally, remove the three Phillips-head screws that mount the power supply to the frame (two inside corners and center near the heat sink).
- 6) Remove the power supply and take it to your work bench or a friend's house.
- 7) Remove the power supply PC board from the metal frame of the power supply to expose the solder connections on the bottom of the board.
- 8) Locate resistor four (marked R4 on the component side which is the top of most boards). This should be a 2.4K resistor color-coded red/yellow/red/gold. Desolder it, remove and replace with your new 1K ohm resistor which should be color-coded brown/black/red/gold.
- 9) Next, locate resistor five (R5), which is a 68 ohm resistor color-coded blue/gray/black/gold. De-solder and replace with your new 91 or 82 ohm resistor.
- 10) Now solder all your connections. Clip leads as short as possible, and check to see that solder joints are neat and clean.

You are done! Now reverse the directions above and reassemble your computer. All connectors are polarized to go in only one way, so do not force. Be sure you do not

pinch any wires when you reinstall the disk drive plate. Put the cover on, power up and your Sanyo should now boot like it did the first day you took it out of the box — before the

additional 128K, before the serial board, before the 8087 and before the Video RAM board!



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Follow the Yellow Brick 'Path'

By Danny Humphress

In the September "Mastering MS-DOS," we began our explorations through a labyrinth of the MS-DOS hierarchal directory system. We continue our adventure this month as we discover special new commands designed to work with directories.

If you were with us on our most recent tour of MS-DOS, you will recall that MS-DOS version 2.11 allows you to create special files called *directories* which may contain other files and even other directories. The MS-DOS commands MKDIR and CHDIR allow you to create new directories and move from one to another.

Killing Directories

As discussed earlier, a directory is simply a file which contains other files. The similarity to a simple file ends here, though. When you use MS-DOS commands such as COPY and ERASE, the files *within* the directory are affected — not the directory itself. If you have a directory called AR and you enter the command ERASE AR, the *directory* would not be erased, but the *files* within that directory would be. Be careful. If you had other directories within AR, you would not be allowed to erase it at all until you removed those directories.

This brings us to a logical question: How do you remove directories? Not with ERASE! A special command, RMDIR (may be abbreviated RD), will remove a directory.

Dead Directories Don't Have Files

As a safety feature, RMDIR will only remove an empty directory. You must first use ERASE to remove all the files from the directory, and make sure that there are no directories below it. If there are other directories below the one you want to delete, you will have to go to the lowest directory and begin your destruction there. Once again, you may not remove a directory until it's completely empty.

Another RMDIR safety feature prevents you from ripping out the floor from beneath your feet. In other words, you cannot remove a directory that is your current default

directory. To use RMDIR, you must move "up" at least one level (toward the root directory) from the directory you are removing.

Since you cannot go higher than the root directory, it is impossible to remove it. On the other hand, it *is* possible to remove the root directory using another method — erase the disk!

Now, let's remove our fictitious AR directory. We'll suppose that AR is a subdirectory of the root directory, that AR is our current default directory and that there are no directories within AR. These commands would get the job done:

CHDIR \	Move to the root directory
ERASE AR	Erase all files within AR
RMDIR AR	Remove the directory

PATH

They say, "build a better program and the world will beat a path to your directory."

Well, I may have taken a *few* liberties with that phrase, but only enough to serve my purpose. The problem with hierarchal directories, you see, is that one never seems to be in the same directory as the program you want to run. MS-DOS' "external" command programs such as CHKDSK, FORMAT and DISKCOPY are usually kept in the root directory. If you were in a lower directory and wanted to use one of these programs, you would normally have to move to their directory.

There *is* another way. The PATH command allows you to give MS-DOS a list of places to look when it can't find a program in the current directory. Once you've given it the list, it will remember it until you change it or reset the computer. In the above case, you would have wanted to tell MS-DOS to look in the root directory after searching the current directory.

For our above example, the PATH command would be:

PATH \

This tells MS-DOS to search the root directory (the backslash means "root") if it fails to find a program in the current directory.

As mentioned, you may specify an entire list of paths. MS-DOS will look in each one of them until it finds the

(Danny Humphress is the owner of a computer software and consulting firm in Louisville, Ky. Danny brings to SOFT SECTOR his extensive experience with small business computers and applications software.)

program you're trying to run. To do so, you just separate the paths with semicolons (;). Example:

PATH \; \UTILITY

The above command would have MS-DOS search the root directory and then a directory called UTILITY if it could not find the program in the current directory.

Remember, you only have to use the PATH command once. MS-DOS will remember it throughout the entire session with the computer. Once you've come up with the PATH sequence that best serves your situation, it's a good idea to make it a part of your AUTOEXEC.BAT batch file so that it is automatically set up each time you reset the computer (with that particular disk).

Limitations

You may have noticed that I used the words "command" and "program" a lot while talking about the PATH command. That is because they are the only types of files that PATH will work with. PATH will cause MS-DOS to search for "executable" (machine language) programs that have either a .COM or .EXE extension.

As a rule of thumb, unless you want to run a program that is executed by just typing the name at the MS-DOS prompt, PATH will not work for you. Likewise, most programs are not "smart" enough to use the path list you specified when they are looking for other programs and/or files. They will generally expect the files to be in the current directory.

MS-DOS external commands (those that are actually

separate programs) such as CHKDSK, EDLIN, FORMAT, DISKCOPY, etc., all work well with PATH.

Dot And Doubledot

You may have noticed that when you did a DIR command on a subdirectory, there were two odd entries at the beginning of the list. The two directories '.' and '..' within each subdirectory are not *real* directories, but rather they are *pointers* to directories.

The single period (.) points to the current directory and may be used within any command to specify the *current* directory. The really useful "phantom entry" is the double period (..). It is used to specify the *previous* directory (the parent of the current directory).

Therefore, the command DIR . would give you a listing of the current directory, and DIR .. would give you a listing of the previous directory.

If you wanted to move up one directory but could not remember its name, CHDIR .. would take you there. Another CHDIR .. would move you up yet another level, and so on until you reach the root directory.

Once again, '.' and '..' may be used anywhere you would use full path names.

Onward!

With an understanding of hierarchal directory systems firmly seated in your mind, we are ready to explore deeper into MS-DOSdom. Next month, we'll search for the true meaning of device drivers. You know device drivers—those funny .SYS files that came on your MS-DOS disk. You'll know what they're for after you read the next "Mastering MS-DOS."



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Points, Lines And Boxes

Part III On Sanyo BASIC Graphics

By Fred Blechman
Soft Sector Contributing Editor

As mentioned earlier, the Sanyo MBC-550 series microcomputers are always in the high-resolution graphics mode, capable of addressing and lighting any of 128,000 dots on the screen in any of the eight colors. You can also draw shapes made up of consecutive lines, draw rectangles by only specifying two corners, and then "fill" the rectangle with any color.

"Setting" A Point

The command used to identify a particular dot, or "point," is: `PSET(X,Y),C` which you can think of as "Point Set." By merely specifying the location in X and Y coordinates, and `COLOR C`, the point is lighted on the screen in that color. If you don't specify a color, then the current character color is used.

The range of values for the `PSET` horizontal X coordinate and the vertical Y coordinate is zero to 32,767 for each! However, anything beyond 639 for X or 199 for Y will fall off the screen unless an earlier `WINDOW` statement enlarges the screen dimensions to the values used for `PSET`. For all but advanced graphics, the `WINDOW` default value of zero to 639 for X and zero to 199 for Y is what you'll use, unless specified otherwise by a `WINDOW` statement.

Type and enter the following to `PSET` the screen corners in four different colors:

```
10 CLS
20 PSET(0,0),7
30 PSET(639,0),5
40 PSET(639,199),3
50 PSET(0,199),1
```

(Fred Blechman, an acknowledged authority on home computers, has written several articles and books related to microcomputers. He is self-taught in electronics and computer BASIC programming and specializes in writing for beginners. Fred may be contacted at 7217 Bernadine Ave., Canoga Park, CA 91307; 818-346-7024.)

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If you are using a monochrome monitor, you may have to turn up the brightness to see the dot in the lower left corner.

Listing 1 draws eight sine waves on your screen, with short groups of different colored dots on a black background.

Lines 20 and 30 calculate the values for the coordinates, and Line 40 places the dot on the screen. The `X MOD 7+1` at the end of Line 40 establishes the dot colors from one to seven, masking out zero.

PRESET

The "opposite" of `PSET` is `PRESET`, which plots a point using the background color. Since lighting a point with the background color makes it seem to disappear, this is effectively the "erase" command for dots that have been `PSET`, unless the background color has changed! If so, before `PRESET` use the `COLOR` statement with a comma and the desired background color number, such as:

```
COLOR,4:PRESET(X,Y)
```

This would change the background color to red without altering the foreground (printing) color, and then "erase" the point at X,Y that was on a red background. If you don't know the current background color, then use `PRESET` by itself, which will return the background color number, such as:

```
IF PRESET=5 THEN or PRINT PRESET
```

Over And Then Down!

Notice that, unlike the `LOCATE` command for specifying text position, where you go down and then over, the `PSET` graphics command goes over and then down!

At first this seems very inconsistent. It really makes a lot of sense, however, when you realize that locating text on a printed page is always specified first by line and then by character along that line. On the other hand,

mathematical graphing functions traditionally use the "Cartesian coordinate system" of specifying horizontal location and then vertical location.

Inconsistencies

There are two inconsistencies you'll need to adjust to. One is that LOCATE commands start with one, and zero is not valid. Graphics commands, including PSET, start with zero.

Also, instead of the graphical "origin" (starting point) being at the lower left-hand corner of the screen, with vertical coordinates moving upward (common in math), the origin of the Sanyo 550 series (and many other computer screens) is the upper left-hand corner, with vertical movement downward. There are methods of translating coordinate systems to simulate real-world graphics, but they won't be covered here.

Drawing LINES

You can imagine the big task it would be to draw a line across the screen if you had to plot every point with PSET. Sanyo BASIC provides the LINE statement that will draw a line between any points within the world coordinate system (zero to 32,767 square). Remember, however, that an appropriate WINDOW must be specified or the line might be off your screen. Here, again, if you leave WINDOW and VIEW alone, you'll be operating within the normal zero to 639 and zero to 199 screen coordinate system.

The syntax for LINE offers various options:

LINE(X1,Y1)-(X2,Y2),C,B

The first coordinates, X1 and Y1, are the starting point. X2 and Y2 are the ending point. If X1 and Y1 are omitted, the ending coordinates of the last LINE or PSET (or 0,0 if no previous LINE or PSET) will be used as a starting point. The C, if used, specifies line color. The B, if used, means you want a box drawn using the starting and ending points as opposite corners. If you want the box filled with the designated color, add an F after the B.

Listing 2 uses LINE to create a box alternating in color from red to yellow.

Next month we'll continue our graphics lesson with circles, arcs and ellipses.

Listing 1: LIST-1.BAS

```
10 CLS
20 FOR X=0 TO 360 STEP .2
30 Y=50*SIN(X*3.14159/180)
40 PSET (X+100,Y+100),X MOD 7+1
50 NEXT X
```

Listing 2: LIST-2.BAS

```
5 CLS
10 LINE(100,100)-(50,50),4,BF
15 FOR D=1 TO 100:NEXT
20 LINE-(100,100),6,BF
30 FOR D=1 TO 100:NEXT
40 GOTO 10
```



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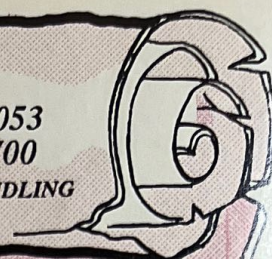
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INPUT/OUTPUT

TIM PURVES

Soft Sector Contributing Editor

Q. I just installed a Video RAM Board in my machine. When I try to load programs in BASIC, all I get is an error "Direct statement in file."

James Parlatore
Plainview, NY

A. The problem sounds like you are trying to load Sanyo BASIC programs in GW-BASIC. The compression routines that are used by the two machines are quite different. The only way to load Sanyo BASIC programs into GW-BASIC is to first save them in ASCII using the command SAVE "FILENAME",A. Next load the program using GW-BASIC. Another way to get a "Direct statement in file" under some BASICs, is to have a line number zero.

(Tim Purves is an expert on the Sanyo MBC-550/555 series computers and is an experienced programmer in assembly code, PASCAL, C and BASIC. He is available to answer any technical questions that the readers of SOFT SECTOR might have. All questions should be addressed to SOFT SECTOR, P.O. Box 385, Prospect, Ky. 40059.)

Q. I would like to buy a good assembler to use on the Sanyo. Which one would be a good buy?

*Edward Solar
Dummer, NH*

A. I personally use Microsoft's *MASM* Ver 3.0. This is a very good assembler, and is reasonably fast and powerful. Another advantage is that it comes with a *Linker*, *DEBUG* and *Make* utility. This package requires DOS 2.11 or later.

Q. When I press the NUM LOCK or GRAPH key in WordStar I get a strange set of characters (Vp6w6n). Why?

Vance Sheets
Convoy, OH

A. This is caused by a bug in *WordStar*. See J. Weaver's excellent *WizStar* program and article for patching *WordStar's* "many features." (SOFT SECTOR, March '85, Page 8.)

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Q. Is the Keytronics 5150 DVORAK keyboard compatible with the Sanyo?

Bernard Tyrka
Watervliet, NY

A. Neither the Keytronics 5150 nor the IBM-compatible will work with the Sanyo. This is due to the differences in the way the keyboard interfaces to the motherboard on both machines.

Q. After installing the Flight Simulator patch, I cannot back up the disk on the Sanyo. What am I doing wrong?

Sidney Shore
Sharon, CT

A. As I mentioned in the article, you cannot make copies of the disk on the Sanyo. This is because the Sanyo isn't fully IBM compatible. The only way to back up the *Flight Simulator* disk, is to find an IBM or fully compatible and make the backups there.

Q. When asked how you found out the functions of Int 10h functions 70h to 73h, your answer was with DEBUG. Is there a command to interrogate DEBUG to get descriptions?

Ashley Campbell
Randolph, NH

A. No, DEBUG knows nothing of the Sanyo and the special routines the Sanyo BIOS supports. The way to find out is to use the "unassemble command" to look at the code and analyze what the original programmer was trying to do.

Q. What are the functions of the FC.EXE program on the DOS 2.11 disk?

Richard Downing
Australia

A. FC.EXE is an intelligent file compare program. It has two modes; a binary mode and a text mode. In the binary mode, it compares the two files literally byte for byte. In the text mode, it has the option to ignore case and white space. Also, it will scan ahead and back to find a match. The format of the FC.EXE program is as follows:

```
FC [/#][/B][/W][/C] FILENAME1.EXT FILENAME2.EXT
/# How many lines to search forward and back for a match,
ranges from one to nine and the default is three.
/B Force a binary compare, all other options are ignored.
/W Ignore white space (tabs and spaces)
/C Ignore case (upper- and lowercase letters are considered
equal)
```

Editor's Note:

Due to space limitations, the *Volume* program promised last month will appear in the November issue.

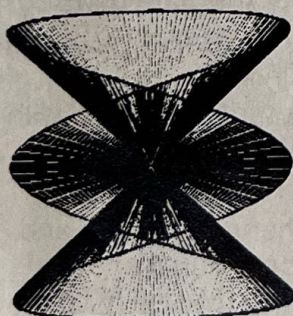
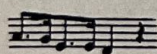


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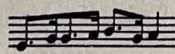
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XREF

By William J. Locke

If you have never used a cross-reference utility before, get ready for a pleasant surprise. A cross-reference is one of the most useful programming tools you're likely to get your hands on.

What is a cross-reference? It is a list of variable names from a BASIC program. No big deal, right? Except each variable has next to it every line number from this program that the variable appears in. This utility also classes the variable into one of eight categories, simple - real, integer, double precision, and string, array - real, integer, double precision and string.

Have you ever wondered, when you're assigning a new variable name, if it has already been used somewhere

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in the program? This list will tell you. Have you ever needed to find every occurrence of a variable name in a program to implement a program change? This list will give you this information.

I think it wise to state from the beginning that this program is rather slow in execution. To cross-reference itself, this program takes about 10 minutes. The reasons for the execution time are twofold. First, it is written in interpreter BASIC and handles every character individually. A utility such as this, written in a compiled language would execute much faster. It is slow, but the price is right and the wait is worth it. Second, it is disk-based and this slows it down some more.

To use *XREF*, there is only one thing to watch for, and that is to make sure your type definition statements are at the very front of the program. If they aren't, the program may not classify your variables properly.

The first input is for output direction. The same thing applies for this program as for *Baslist* (SOFT SECTOR April '85, Page 60). Use PRN for the printer, AUX for the RS-232 or direct the output to a disk file.

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The internal parts of the program are

frequently commented on inside the program. I will go over the general flow of the program and point out some of the interesting parts.

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The setup routine (lines 160 to 440) contains the definition, dimensioning and input statements. The program file is opened in Line 220. Lines 230 to 330 set up the sorted keyword list. The sorted keyword list is necessary to allow a timesaving keyword check. Lines 340 to 430 set up headings used in the final print.

Lines 470 to 480 read a program line into A\$. This is the read line subroutine.

The next routine is the most complex. Its job is to take out the variables in the line and add the line number to a list when needed. In order to do this, we "weed" out words using a character-by-character comparison. This routine uses lines 490 to 1380.

The most interesting part of this routine is how we build our variable to test. Once this variable is built, we must test it to see if it is a keyword.

A Program Variable Cross-Reference Utility

CHAR\$ holds the current character, XPDS holds the current position in the line, TEST\$ holds the test string and A holds the ASCII value of the current character. Line 610 checks for double quotes; characters inside double quotes are ignored. Line 630 ends the routine if a single quote is encountered. Line 640 adds a legal character to the test string. Lines 650 to 660 handle the flow when a definition statement is in effect and call a routine (1030 to 1110) that sets the definition array. This array holds the definition value for every letter of the alphabet and the value is used later to type the variables.

Lines 670 to 740 reject certain unwanted test strings. These include numbers, Hex numbers, etc. Line 750 calls the routine that checks for key words. This routine (910 to 1020) deserves a little attention. RES holds the result of the routine, XCK the array number of the current check, XL the current number of the lowest check, XH the current number of the highest check and XCK1 the number of the prior check. This routine will check a list of strings (WORD\$) for the occurrence of the test string (TEST\$). The list must be in sort order. The comparison eliminates half the list at each check. This speeds the routine a lot. Also, the list may get very large and the time to check it will not get much larger.

The routine works as follows: Line 930 sets the result to not found. Lines 940 to 950 set the starting values for the rest of the variables. Line 960 checks to see if the same keyword is checked twice in a row, and ends the routine with the test string not found if this is the case. Line 970 sets the prior check

equal to the current check. Line 980 sets the new check value. Line 990 tests for a greater than condition and if found sets the low number check and loops back to 960. Line 1000 tests for a less than condition and if found sets the high number check and loops back to 960. If the routine reaches Line 1010, then the test string is a keyword. This line sets the result to a found condition and Line 1020 returns to the calling routine.

This routine deserves a little more analysis than this. You may find use for this technique in other programs. XCK is the array element that we are comparing to the test string TEST\$. Notice that the value of XCK is set halfway between XL and XH which are the upper and lower limits (these are set at the start of the routine to zero for the lower and the number of elements in the array plus one for the upper). On the first pass, XCK is set at half the array size. If the test string is greater than the array element, this tells us that the test string (if it exists in the array) is in the upper half. We then set XL=XCK and loop back. Then XCK is set halfway between XL and XH again and tested. This continues until the test string is found or the same array element is tested twice. If you actually need the array element number, XCK holds this value if the test string was found.

If you're paying attention, you will notice that each comparison eliminates half the remaining array. Comparing this method to a sequential check of a list containing 1024 elements, a sequential check takes an average of 512 comparisons to find a match. The average will actually be higher if you

have a lot of cases where the test string is not found because it takes 1024 comparisons to check the entire list. This method takes at most 11 checks to find out that the test string is not in a list of 1024 — 10 at most if it is found. The really impressive concept is that if the array doubles in size, it will only take one more check to find the test string. The only problem is the list must be in sort order. Actually a "tree" method will work without sorting, but that's an article in itself. On with the program.

Upon return from the reserved word check, Line 760 checks to see if TEST\$ is a variable. If it is, the routine to handle variables is called and then the program branches to Line 810. If the test string is a reserved word, Line 770 tests for a REM or DATA statement and ends the line check if found. Lines 780 to 800 check for a definition statement. Line 810 clears the test string and loops back to Line 560. Line 820 ends the line check routine.

The only other routine that deserves explanation is the variable handler (lines 1120 to 1380). This routine is called from Line 760 in the line check routine. Its job is to classify the variable and add it to the variable array. Lines 1140 to 1240 class the variable as integer, real, double precision or string. Line 1250 classes the variable as simple or array. Line 1260 either adds the line number to an existing array element or creates a new array element with the variable.

After the line evaluate routine comes the sort routine. You can write many articles on sort routines, however, this article is not one. This is simply a

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Lines 10 through 150 control the main flow of the program. These lines call subroutines for a specific task as follows: Line 30 sets up the program. Line 50 reads a line from the file. Line 70 evaluates the line (this routine is the "meat" of the program). Line 90 tests for the end of the program file. Line 110 sorts the variables found in the program. Line 130 prints the results of the program. Line 150 ends the program.

The setup routine (lines 160 to 440) contains the definition, dimensioning and input statements. The program file is opened in Line 220. Lines 230 to 330 set up the sorted keyword list. The sorted keyword list is necessary to allow a timesaving keyword check. Lines 340 to 430 set up headings used in the final print.

Lines 470 to 480 read a program line into A\$. This is the read line subroutine.

The next routine is the most complex. Its job is to take out the variables in the line and add the line number to a list when needed. In order to do this, we "weed" out words using a character-by-character comparison. This routine uses lines 490 to 1380.

The most interesting part of this routine is how we build our variable to test. Once this variable is built, we must test it to see if it is a keyword.

A Program Variable Cross-Reference Utility

modified shell sort which will serve our purpose.

Next is the print routine. Notice that we open a buffer for sequential output and use PRINT# statements instead of LPRINT statements. The output may go to a file or device.

The DATA statements are contained in lines 1800 to 1950. I think I have covered most any keyword you might use. If you see one pop up in your cross-reference, merely add it to the DATA statements here. Make sure the XOR keyword is last, or the program will not function properly.

Variable Listing

Simple Real Variables

A	ASCII value of CHAR\$
A1	ASCII value used in definition handling
A2	Detect value
Detect	Indicates variable type
I	Local counter

I1	Counter in definition handler
Ignore	Toggle, one to ignore characters, zero to evaluate characters
IWord	Count of reserved words
J	Local counter
RES	Reserved word indicator
X1	Number of elements in sort array
X2	Sort increment
X3	Length of variable name in variable handler routine
X4	Length of line number in variable handler routine
XCK	Current array number in reserved word test
XCK1	Previous array number in reserved word test
XH	Upper limit in reserved word test
XL	Lower limit in reserved word test
XLC	Line count in print routine
XLine	Line number in evaluate line routine

XPOS	Character position in line
XV	Array number in variable handler routine

Simple String Variables

A\$	Line contents
B\$	Line number
CHAR\$	Current character content
D\$	Local string manipulator
F\$	Output filename
F1\$	Input filename
M	Holding variable for sort routine
TEST\$	Test string for evaluate line routine

Array Real Variables

Detect	Definition values
--------	-------------------

Array String Variables

D\$	Holding array for definition handler
M	Variable names
MH	Headings
WORD\$	Reserved word list

The listing: XREF.BAS

```

10 '
20 '***** CALL SETUP SUB *****
30 GOSUB 180:CLS:PRINT "      STANDBY - WORKING":LOCATE 8,10:PRINT "ON LINE NUMBER:"
40 '***** READ LINE FROM FILE *****
50 GOSUB 470
60 '***** EVALUATE LINE *****
70 GOSUB 510
80 '***** TEST FOR LAST LINE *****
90 IF EOF(1) THEN GOTO 110 ELSE GOTO 50
100 '***** SORT VARIABLES *****
110 CLS:PRINT "      VARIABLE SORT":GOSUB 1410

```

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```

120 ***** PRINT OUT RESULTS *****
130 GOSUB 1570
140 ***** END PROGRAM *****
150 CLOSE:END
160 '
170 ***** SETUP SUBROUTINE *****
180 DEFSTR M
190 DIM M(300),WORDS$(300),MH(13),DETECT(125,3)
200 INPUT "ROUTE OUTPUT TO - PRN - X:FILENAME.EXT ";F$
210 INPUT "FILE TO CROSS REFERENCE ";F1$
220 OPEN"I",1,F1$
230 I=0
240 WHILE M(I)<>"XOR"
250 I=I+1
260 READ M(I)
270 WEND
280 IWORD=I
290 X1=I
300 CLS:PRINT "                KEYWORD SORT":GOSUB 1410
310 FOR I=1 TO IWORD
320 WORD$(I)=M(I):M(I)=""
330 NEXT I
340 X1=0
350 M(0)="-1"
360 MH(0)="Simple Real Variables"
370 MH(1)="Simple Integer Variables"
380 MH(2)="Simple String Variables"
390 MH(3)="Simple Double Precision Variables"
400 MH(10)="Array Real Variables"
410 MH(11)="Array Integer Variables"
420 MH(12)="Array String Variables"
430 MH(13)="Array Double Precision Variables"
440 RETURN
450 '
460 ***** READ LINE SUBROUTINE *****
470 LINE INPUT #1,A$
480 RETURN
490 '
500 ***** EVALUATE LINE ROUTINE *****
510 XLINE=VAL(A$):'                               Get line number
520 LOCATE 10,15:PRINT XLINE
530 B$=STR$(XLINE)
540 IGNORE=0
550 XPOS=LEN(B$)-1:'                               Set Initial Position
560 XPOS=XPOS+1:'                                   Increment Position
570 IF XPOS>LEN(A$)+1 THEN GOTO 820
580 IF XPOS>LEN(A$) THEN A=58:GOTO 650
590 CHAR$=MID$(A$,XPOS,1):'                       Get character from line
600 A=ASC(CHAR$):'                               Set test value for character
610 IF A=34 THEN GOSUB 850:GOTO 560:'             Toggle Ignore if dbl quote
620 IF IGNORE=1 THEN GOTO 560:'                   Get next character if Ignore on
630 IF A=39 THEN GOTO 820:'                       End routine if single quote
640 IF A=33 OR A=35 OR A=36 OR A=37 OR A=38 OR (A>47 AND A<58) OR (A>64 AND A<12
3) THEN GOSUB 890:GOTO 560:'                   Add character to test var
650 IF A=58 AND DETECT>0 THEN GOSUB 1050:DETECT=0:' Reset Detect Var
660 IF DETECT>0 THEN IF A=45 THEN GOSUB 890:GOTO 560:ELSE GOTO 560:'
670 IF LEN(TEST$)=0 THEN GOTO 560:'               Get next char if in def area
680 IF LEFT$(TEST$,1)="$" THEN GOTO 810:'         Ignore extra delimiter
680 IF LEFT$(TEST$,1)="$" THEN GOTO 810:'         Ignore Hex Values

```



```

690 IF LEFT$(TEST$,1)="#" THEN GOTO 810
700 IF LEFT$(TEST$,1)="$" THEN GOTO 810
710 IF LEFT$(TEST$,1)="#" THEN GOTO 810
720 IF LEFT$(TEST$,1)="!" THEN GOTO 810
730 IF LEFT$(TEST$,1)="0" THEN GOTO 810
740 IF VAL(TEST$)>0 THEN GOTO 810:'
750 GOSUB 930:'
760 IF RES=0 THEN GOSUB 1140:GOTO 810:'
770 IF TEST$="REM" OR TEST$="DATA" THEN GOTO 820:'End Routine if remark
780 IF TEST$="DEFINT" THEN DETECT=1:GOTO 810
790 IF TEST$="DEFSTR" THEN DETECT=2:GOTO 810
800 IF TEST$="DEFDBL" THEN DETECT=3:GOTO 810
810 TEST$="":GOTO 560:'
820 TEST$="":RETURN:'
830 '
840 '***** TOGGLE IGNORE
850 IF IGNORE=0 THEN IGNORE=1 ELSE IGNORE=0
860 RETURN
870 '
880 '***** ADD CHAR TO TEST
890 TEST$=TEST$+CHAR$
900 RETURN
910 '
920 '***** TEST FOR RESERVED WORD
930 RES=0
940 XL=0:XCK=1
950 XH=IWORD+1:XCK1=0
960 IF XCK1=XCK THEN GOTO 1020

```

Ignore Numbers
Check for reserved word
If not then call variable handler
Clear test and loop to start
Exit routine - EVALUATE LINE

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```

970 XCK1=XCK
980 XCK=INT((XH-XL)/2)+XL
990 IF TEST$>WORD$(XCK) THEN XL=XCK:GOTO 960
1000 IF TEST$<WORD$(XCK) THEN XH=XCK:GOTO 960
1010 RES=1
1020 RETURN
1030 '
1040 '***** DEFINITION HANDLER
1050 FOR I=1 TO LEN(TEST$)
1060 D$(I)=MID$(TEST$,I,1)
1070 A1=ASC(D$(I))
1080 IF D$(I-1)="-" THEN FOR I1=A2 TO A1:DETECT(I1,DETECT)=1:NEXT I1
1090 IF D$(I)<>"," AND D$(I)<>"-" THEN DETECT(A1,DETECT)=1:A2=A1
1100 NEXT I
1110 TEST$="":RETURN
1120 '
1130 '***** VARIABLE HANDLER
1140 D$=LEFT$(TEST$,1)
1150 A1=ASC(D$)
1160 A2=0
1170 FOR I=1 TO 3
1180 IF DETECT(A1,I)>0 THEN A2=I
1190 NEXT I
1200 IF RIGHT$(TEST$,1)="/" THEN A2=1
1210 IF RIGHT$(TEST$,1)="$" THEN A2=2
1220 IF RIGHT$(TEST$,1)="#" THEN A2=3
1230 D$=RIGHT$(STR$(A2),1)+TEST$
1240 TEST$=D$
1250 IF CHAR$="(" THEN TEST$="1"+D$ ELSE TEST$="0"+D$
1260 I=1:XV=0
1270 WHILE LEN(M(I))>0
1280 X3=INSTR(M(I),",")-1
1290 IF LEFT$(M(I),X3)=TEST$ THEN XV=I
1300 I=I+1
1310 WEND
1320 IF XV=0 OR LEN(M(XV))>240 THEN GOSUB 1350:GOTO 1340
1330 M(XV)=M(XV)+", "+STR$(XLINE):IF XV>X1 THEN X1=XV
1340 RETURN
1350 X4=LEN(STR$(XLINE))
1360 XV=I
1370 M(XV)=TEST$+", "+STRING$(7-X4," ")+STR$(XLINE)
1380 RETURN
1390 '
1400 '***** SORT ROUTINE *****
1410 LOCATE 10,15:PRINT "PLEASE STANDBY - SORTING"
1420 X2=2^INT(LOG(X1)/LOG(2))-1
1430 LOCATE 5,6:PRINT "SORT INCREMENT IS ";X2;" NUMBER TO SORT IS ";X1:LOC
1440 ATE 7,6:PRINT "ON ELEMENT ":FOR I=1 TO X1-X2:LOCATE 7,20:PRINT " ";I;" "
1440 IF M(I)<=M(I+X2) THEN GOTO 1520
1450 M=M(I+X2):M(I+X2)=M(I)
1460 IF I<=X2 THEN M(I)=M:GOTO 1520
1470 FOR J=I-X2 TO 1 STEP -X2
1480 IF M>=M(J) THEN GOTO 1510
1490 M(J+X2)=M(J)
1500 NEXT J
1510 M(J+X2)=M
1520 NEXT I
1530 X2=INT(X2/2):IF X2>0 THEN GOTO 1430
1540 PRINT "SORT COMPLETE":RETURN

```



```

1550 '
1560 '***** PRINT ROUTINE *****
1570 OPEN "O",3,F$
1580 PRINT# 3," " VARIABLE LISTING FOR ";F1$:PRINT #3," ":XLC=XLC+2
1590 FOR I=1 TO X1
1600 IF VAL(M(I))<>VAL(M(I-1)) THEN GOSUB 1700
1610 PRINT #3,MID$(M(I),3,79):XLC=XLC+1
1620 IF LEN(M(I))>81 THEN PRINT #3,MID$(M(I),82,79):XLC=XLC+1
1630 IF LEN(M(I))>160 THEN PRINT #3,MID$(M(I),161,79):XLC=XLC+1
1640 IF LEN(M(I))>239 THEN PRINT #3,MID$(M(I),240,15):XLC=XLC+1
1650 PRINT #3," ":XLC=XLC+1
1660 GOSUB 1750
1670 NEXT I
1680 GOSUB 1780
1690 RETURN
1700 PRINT #3," ":PRINT #3," "
1710 PRINT #3,MH(VAL(M(I)))
1720 PRINT #3," "
1730 XLC=XLC+4
1740 RETURN
1750 IF XLC<53 THEN RETURN
1760 GOSUB 1780
1770 RETURN
1780 PRINT #3,CHR$(12):XLC=0
1790 RETURN
1800 '
1810 '***** DATA STATEMENTS *****
1820 DATA ABS,ALL,AND,AS,ASC,ATN,ATTR$,AUTO,BASE,BEEP,CALL,CDBL,CHAIN,CHR$,CINT,

```

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 1830 DATA DATA, DATE\$, DEF, DEFB, DEFINT, DEFSNG, DEFSTR, DELETE, DIM, EDIT, ELSE, END, EOF,
 EQV, ERASE, ERL, ERR, ERROR, EXP, FIELD, FILES, FIX, FN, FOR, FRE, GCURSOR, GET, GO, GOSUB, GO
 TO
 1840 DATA HEX\$, IF, IMP, INIT\$, INKEY\$, INP, INPUT, INPUT#, INPUT\$, INSTR, INT, KEY,
 KILL, LEFT\$, LEN, LET, LFILES, LINE, LIST, LLIST, LOAD, LOC, LOCATE, LOF, LOG, LPOS, LPRINT, LS
 ET
 1850 DATA MERGE, MID\$, MKD\$, MKI\$, MKS\$, MOD, NAME, NEW, NEXT, NOT, OCT\$, OFF, ON, OPEN, OPTIO
 N, OR, OUT, PACK\$, PAINT, PEEK, POINT, POKE, POS, PRESET, PRINT, PRINT#, PRINT\$, PSET, PUT
 1860 DATA RANDOMIZE, READ, REM, RENUM, RESET, RESTORE, RESUME, RETURN, RIGHT\$, RND, RSET, R
 UN, SAVE, SEG, SGN, SIN, SPACE\$, SPC, SQR, STEP, STICK, STOP, STR\$, STRIG, STRING\$, SUB, SWAP, S
 YMBOL, SYSTEM
 1870 DATA TAB, TAN, THEN, TIME\$, TINPUT, TROFF, TRONN, UNPACK\$, USING, USR, VAL, VARPTR, VIE
 W, WAIT, WEND, WHILE, WIDTH, WINDOW, WRITE, WRITE#
 1880 DATA STR\$, PRINT#1, PRINT#2, PRINT#3, PRINT#4, PRINT#5, INPUT#1, INPUT#2, INPUT#3, I
 NPUT#4, INPUT#5, WRITE#1, WRITE#2, WRITE#3, WRITE#4, WRITE#5
 1890 DATA PRINT#6, PRINT#7, PRINT#8, PRINT#9, PRINT#10, INPUT#6, INPUT#7, INPUT#8, INPUT
 #9, INPUT#10, WRITE#6, WRITE#7, WRITE#8, WRITE#9, WRITE#10
 1900 DATA PRINT#11, PRINT#12, PRINT#13, PRINT#14, PRINT#15, INPUT#11, INPUT#12, INPUT#1
 3, INPUT#14, INPUT#15, WRITE#11, WRITE#12, WRITE#13, WRITE#14, WRITE#15
 1910 DATA PRINT#1, INPUT#1
 1920 DATA CLOSE#1, CLOSE#2, CLOSE#3, CLOSE#4, CLOSE#5, PUT#1, PUT#2, PUT#3, PUT#4, PUT#5,
 GET#1, GET#2, GET#3, GET#4, GET#5
 1930 DATA CLOSE#6, CLOSE#7, CLOSE#8, CLOSE#9, CLOSE#10, PUT#6, PUT#7, PUT#8, PUT#9, PUT#1
 0, GET#6, GET#7, GET#8, GET#9, GET#10
 1940 DATA CLOSE#11, CLOSE#12, CLOSE#13, CLOSE#14, CLOSE#15, CLOSE#11, PUT#12, PUT#13, PU
 T#14, PUT#15, GET#11, GET#12, GET#13, GET#14, GET#15
 1950 DATA TO, XOR



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The Development Of Life On Your Sanyo

An enticing math game that has survived through generations

By Jeff Sorensen and Phil MacKenzie

Life is a popular and peculiar mathematical game that was the brainstorm of mathematician John Horton Conway. It was originally practiced as a solitaire board game but is ideally suited to computer application due to its simple rules.

Naturally, computer scientists were quick to examine this game in detail and have

discovered countless fascinating properties, making *Life* far more than just a game.

Conceptually, *Life* is played on an infinite grid of squares (i.e., an infinite checker board). Each square can potentially contain a "life unit." A "neighbor" is a life unit in any of the eight surrounding squares. Life essentially has two rules that can be stated as follows:

Birth — A new life unit will be born in each empty square that has exactly three neighbors.

Death — An existing life-unit will die if it has fewer than two neighbors (isolation) or more than three neighbors (overcrowding).

All births and deaths occur simultaneously in what is called a "tick" or generation. Conway chose these rules to make the game both simple yet unpredictable. When played as a board game, executing these rules is both tedious and confusing; one mistake can ruin an experimental pattern. However, as a computer simulation, the complex patterns that develop are a joy to watch.

Machine Language And BASIC

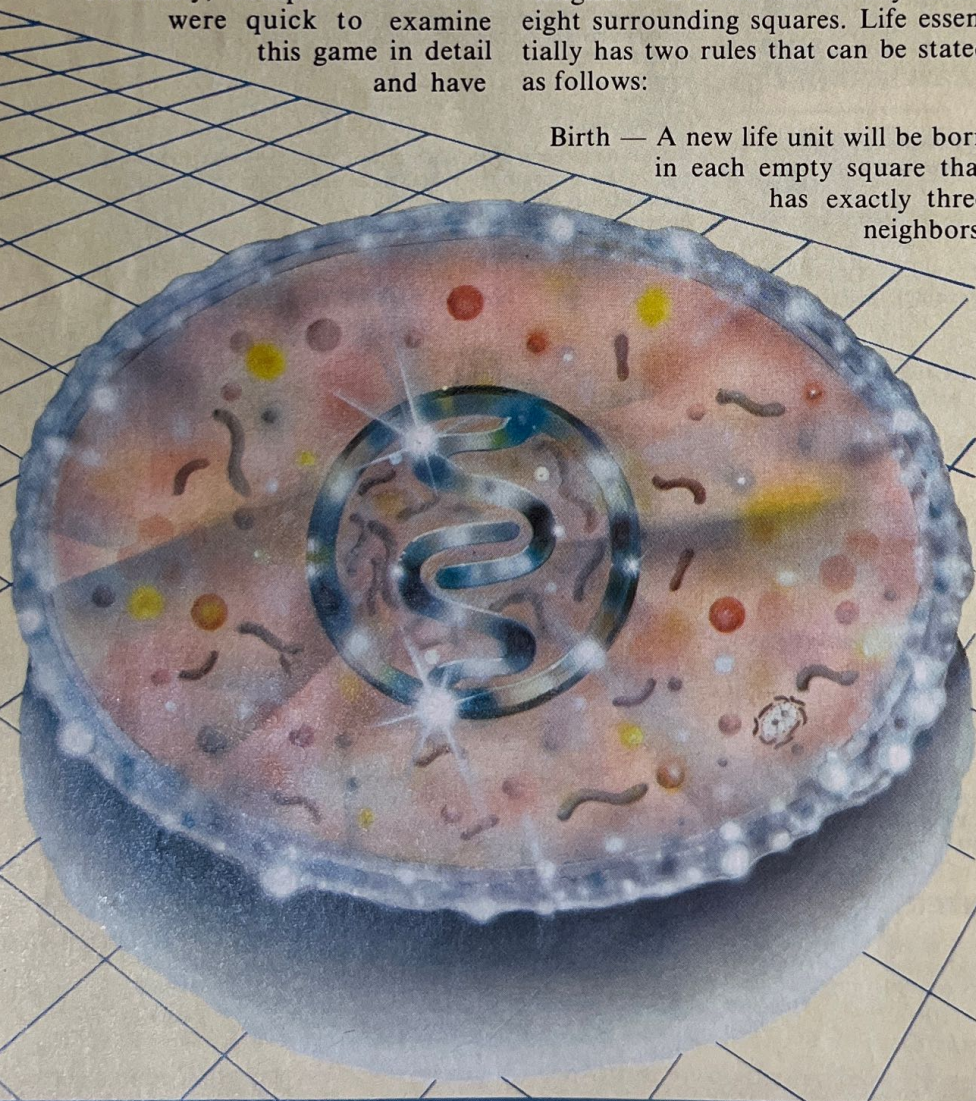
Obviously, *Life* on the Sanyo cannot be played on an infinite grid. For programming simplicity and memory conservation, the grid is limited to 78 by 48. However, the sacrifice in screen size is by far outweighed by the speed of each tick. The program can compute almost seven generations a second! In most *Life* simulations, the number of neighbors of each cell is calculated during each tick; this would be close to 30,000 calculations! However, this simulation maintains a table of existing neighbors and updates this with each birth and death, greatly reducing the number of calculations.

The BASIC program (Listing 1) will automatically load the machine language code into high memory. The machine language routines (Listing 2) are accessed by five different USR calls. The BASIC program provides convenient facilities to edit, save and study *Life* patterns. There is also a list of commands and their actions.

A life unit is represented by a red square. The cursor is represented by two vertical lines that appear to the left and right of a potential life unit. If testing a very large or complex pattern, it is advisable to save it. There is no way of backing up once a generation has passed, except to reload or redraw the pattern.

Once the machine language routines have been loaded by the first run, a RUN 300 command may be substituted for all subsequent runs. This will bypass

(Philip MacKenzie and Jeff Sorensen are widely recognized in the Sanyo world. Philip is currently studying mathematics at the University of Michigan and Jeff is studying computer and systems engineering at Rensselaer Polytechnic Institute.)



the routines to install the machine language program, thus speeding execution.

Patterns Of Life

The top line in Figure 1 shows a variety of common stable life patterns. The second line gives some examples of the more interesting, oscillating patterns. Many of these are common and will form from other patterns. The ones that oscillate over more than two ticks, however, are the most fascinating. These include the Pinwheel, Figure 8 and the Tumbler.

The third line illustrates several of the known patterns that replicate themselves as they move across the screen. These are some of the most fascinating of all patterns as their translational motion makes them seem almost alive. The Glider moves diagonally one square every four generations (one quarter the speed of light). The Spaceships and the Puffer Train move one square horizontally every two generations (one half the speed of light). The Puffer Train leaves behind a "cloud" of life units that eventually fade away, much like smoke from a train. A close observation of this form reveals two spaceships that play a crucial role in its motion.

Conway originally thought that all life patterns would eventually stabilize in a finite form. He was proven wrong with the discovery of the Glider Gun shown at the top of Figure 2. This remarkable arrangement shoots out a glider every thirty ticks!

The patterns in the bottom half of Figure 2 are two of the smaller Methuselahs. The Thunderbird has a life of 243 generations and the Bulldozer has a life of 148 generations. Both will fit on the Sanyo grid, though the Bulldozer must be placed in the lower right section of the screen.

Life And Beyond

Researchers have found that many complex patterns can assemble themselves from several carefully placed gliders. The gun shown can be generated by 13 strategically positioned gliders. As if anyone needed more gliders, a huge glider factory called a "breeder" was developed at Michigan Institute of Technology and is capable of generating thousands of glider guns!

Each generation of *Life* produces only one successor. However, some patterns can be created that have no predecessors, they must be directly

created to exist. Hence, these patterns are named "Garden of Eden" patterns. They are extremely difficult to find. The only two that are known are 9 by 33 and 6 by 122. There are likely more such patterns, but to find them every previous possible generation must be examined — a lengthy procedure.

It is now known that on the *Life* grid, universal computers can be built using gliders as impulses. *Life* has also been used in work with self-replicating machinery. Models based on *Life* have been used in sociology, cosmology, automation and physics, to name just a few of the developments. One of the most impressive aspects of *Life* is the utter unpredictability of patterns that change under even simple rules. Certainly, the last page of the book of *Life* has not been written. There are still many unanswered questions.

This article was written to give you a "taste" of the mathematics which serve as the basis for the game of *Life*, but only by watching the program's hypnotic, almost organic, patterns can you appreciate the captivating nature of this thought provoking game.

Command List

Cursor (Arrow) Keys	Move cursor
	Return cursor to center of screen
+	Set a life unit at cursor position
-	Reset a life unit at cursor position
*	Erase the screen (requires confirmation)
0	Reset time to zero
ENTER	Start <i>Life</i> at full speed (will stop if stable or upon keypress)
.	Advance one <i>Life</i> generation
?	Random screen generator*
H	Display a population histogram
G	Display grid limits
S	Save screen to disk
L	Load screen from disk
	Optional offset may be specified**

*The density of the life units must be input as a decimal between zero (no units living) and one (all units living).

**The load offset parameter can be used to load patterns to different locations on the screen.

ex. Offset=80 Moves the pattern down one line
Offset=-15 Moves pattern left 15 positions
Offset=310 (80*2-10) moves pattern down two lines and left 10 positions

Definitions

Garden of Eden pattern — a pattern which does not have a predecessor, and thus cannot be generated by any other pattern.

Generation (Tick) — the change in the grid pattern due to one simultaneous set of births and deaths.

Grid — ideally, the infinite checkerboard on which *Life* is played (on the Sanyo, it is a 78 by 48 checkerboard).

Life unit — a square on the grid which is alive. Represented by red squares on the Sanyo screen.

Life history — the complete set of generations from the original pattern to a final set of stable or oscillating patterns.

Methuselah — a pattern of less than 10 life units which does not stabilize in 50 generations.

Neighbor — a life unit in any of the eight surrounding squares on the grid.

Oscillating pattern — a pattern which repeats itself after two or more generations.

Population — the total number of life units on the grid.

Speed of Light — one square per tick, thus, the fastest speed at which any object can move.

Stability — the state in which all patterns on the grid are either stable or oscillating.

Stable pattern — a pattern in which no new life units are born and no existing units die.

For more information on this topic:

Berlekamp, Elwyn, John Conway, and Richard Guy. *Winning Ways*, Vol. 2. Academic Press, 1982.

Byte. Vol 3. December 1978.

Gardner, Martin. *Wheels, Life and Other Mathematical Amusements*. W. H. Freeman Company, 1983.

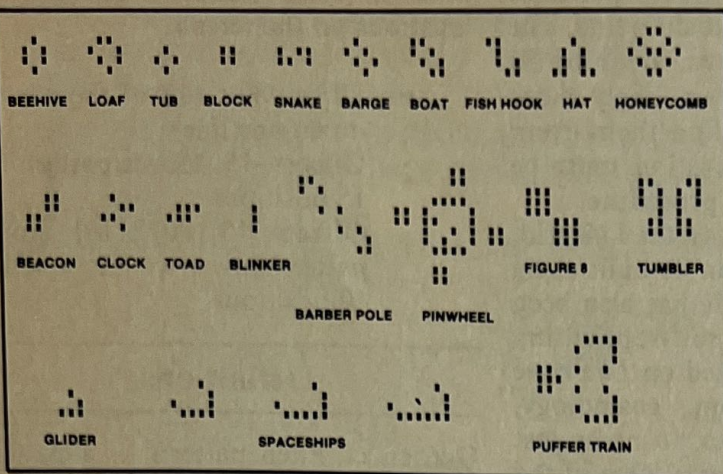


Figure 1

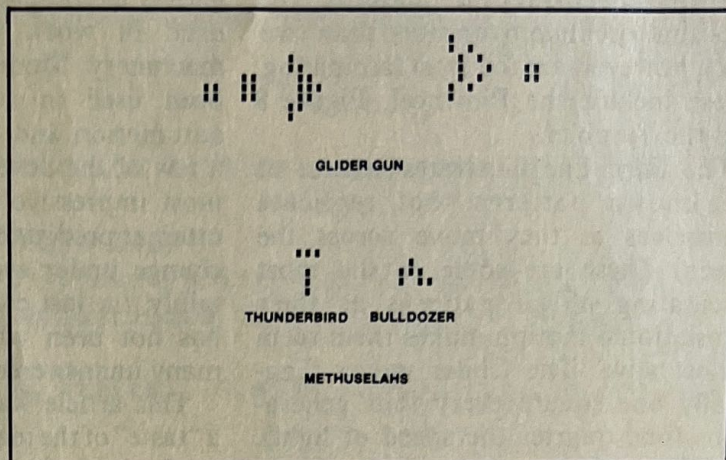


Figure 2

Listing 1: LIFE.BAS

```

10 CLEAR 581:DEF SEG=SEG(4):DEFINT A-X
20 CLS:LOCATE 12,18,0:PRINT "Please wait for machine language module to load."
30 FOR G=8000 TO 8280:READ I:POKE G,I:NEXT G
40 FOR G=0 TO 79:POKE G,32:POKE G+3920,32:NEXT G
50 FOR G=80 TO 3840 STEP 80:POKE G,32:FOR H=G+1 TO G+78:POKE H,0:NEXT H
60 POKE G+79,32:NEXT G
70 DATA 139,23,30,140,200,142,216,142,192,190,0,0,191,160,15,185
80 DATA 208,7,243,165,190,80,0,51,255,185,0,15,184,0,240,142
90 DATA 192,138,132,160,15,60,3,116,49,168,16,116,84,60,18,116
100 DATA 80,60,19,116,76,254,76,175,254,76,176,254,76,177,254,76
110 DATA 255,254,76,1,254,76,79,254,76,80,254,76,81,128,36,239
120 DATA 51,192,171,171,74,128,230,127,235,42,254,68,175,254,68,176
130 DATA 254,68,177,254,68,255,254,68,1,254,68,79,254,68,80,254
140 DATA 68,81,128,12,16,184,60,60,171,170,71,66,128,230,127,235
150 DATA 3,131,199,4,70,226,154,31,137,23,203,139,7,30,139,240
160 DATA 209,224,209,224,139,248,131,198,80,140,200,142,216,184,0,240
170 DATA 142,192,185,1,0,51,210,246,4,48,116,174,235,217,139,7
180 DATA 30,139,240,209,224,209,224,139,248,131,198,80,140,200,142,216
190 DATA 184,0,240,142,192,185,1,0,51,210,246,4,16,116,184,233
200 DATA 99,255,30,140,200,142,216,190,0,0,185,160,15,129,36,32
210 DATA 32,131,198,2,226,247,31,184,3,0,205,16,30,140,200,142
220 DATA 216,184,0,240,142,192,51,255,139,215,190,80,0,185,0,15
230 DATA 246,4,16,116,11,38,199,5,60,60,38,198,69,2,60,66
240 DATA 131,199,4,70,226,234,233,110,255
300 DEFINT A-X:DEF SEG=SEG(4):DEF USR0(A)=8000:DEF USR1(A)=8139
310 DEF USR2(A)=8174:DEF USR3(A)=8231:DEF USR4(A)=8210
320 X=39:Y=24:PT=USR3(0):DIM HS(127)
330 A$="##,###=t #,###=Pop & & Press ESC for help."+SPACE$(25)
1000 HS(TM AND 63)=PT:KYS$=INKEY$:IF KYS$<>" THEN 1040

```



```

1010 C=6:GOSUB 2110:LOCATE 25,1,0:PRINT USING A$;TM,PT,V$;:V$=""
1020 KY$=INKEY$:IF KY$="" THEN 1020
1030 C=0:GOSUB 2110:GOTO 1040
1040 KY=ASC(KY$):IF KY<12 THEN 1000
1050 ON KY-11 GOTO 2210,2310:IF KY<27 THEN 1000
1060 ON KY-26 GOTO 2000,2220,2230,2240,2250:IF KY<42 THEN 1000
1070 ON KY-41 GOTO 2410,2510,1000,2520,2610,1000,2710,1000,1000,1000,2220,2250,2
230,2210,2240
1080 IF KY=63 THEN 2810 ELSE IF KY<71 THEN 1000
1090 IF KY>96 THEN KY=KY-32
1100 ON KY-70 GOTO 2910,3010,1000,1000,1000,3110:IF KY<83 THEN 1000
1110 IF KY=83 THEN 3210 ELSE 1000
2000 REM *** HELP ROUTINE ***
2010 CLS:RESTORE 2040
2020 FOR G=1 TO 15:LOCATE 2+G,25,0:READ R$,S$:COLOR 4:PRINT R$;:COLOR 2:PRINT TA
B(40)S$;:NEXT G
2030 IF INKEY$="" THEN 2030 ELSE PT=USR3(0):GOTO 1000
2040 DATA Arrow Keys,Move Cursor,+,Set point,-,Reset point,*,Erase Screen,0,Rese
t time counter,,,".",Single Generation,RETURN,Continuous Generations,,,?,Random s
creen generator
2050 DATA H,Population history,G,Display grid limits,,,S,Save screen,L,Load scre
en
2100 REM *** CURSOR DRAW SUBROUTINE ***
2110 LINE (X*8,Y*4)-(X*8,Y*4+2),C:LINE (X*8+7,Y*4)-(X*8+7,Y*4+2),C:RETURN
2200 REM **** THE CURSOR MOVEMENT ROUTINE FOLLOW ****
2210 X=39:Y=24:GOTO 1000
2220 X=X-1:IF X<1 THEN X=78:GOTO 1000 ELSE 1000
2230 X=X+1:IF X>78 THEN X=1:GOTO 1000 ELSE 1000
2240 Y=Y-1:IF Y<0 THEN Y=47:GOTO 1000 ELSE 1000
2250 Y=Y+1:IF Y>47 THEN Y=0:GOTO 1000 ELSE 1000
2300 REM **** THE CONTINUOUS FRAME COMMAND (RET) ****
2310 LOCATE 25,1,0:PRINT "Press any key to halt."SPACE$(54);
2320 HG=USR(PY-32768!):IF HG<0 THEN V$="Stable":GOTO 1000
2330 PT=HG:TM=TM+1:HS(TM AND 127)=PT:IF INKEY$="" THEN 2320 ELSE 1000
2400 REM **** ERASE SCREEN COMMAND (*) ****
2410 LOCATE 25,35,1:INPUT(1);"Erase screen? Confirm: ",Q$:IF Q$<>"Y" AND Q$<>"y"
THEN 1000
2420 PT=USR4(0):TM=0:GOTO 1000
2500 REM *** SET/RESET COMMANDS FOLLOW (+,-) ***
2510 PT=PT+USR1(X+Y*80):GOTO 1000
2520 PT=PT+(USR2(X+Y*80)<>0):GOTO 1000
2600 REM *** SINGLE GENERATION COMMAND (.) ***
2610 HG=USR(PY-32768!):IF HG<0 THEN V$="Stable" ELSE PT=HG:TM=TM+1
2620 GOTO 1000
2700 REM *** RESET TIME COMMAND (0) ***
2710 TM=0:GOTO 1000
2800 REM *** RANDOM SCREEN GENERATOR (?) ***
2810 LOCATE 25,35,1:INPUT(5);"Random screen density (0-1): ",R$
2820 Z=VAL(R$):IF Z<=0 OR Z>1 THEN 1000
2830 PT=USR4(0):FOR G=0 TO 3840:IF RND(2)<Z THEN PT=PT+USR1(G)
2840 NEXT G:TM=0:GOTO 1000
2850 FOR I=MB TO TM:G=I AND 127
2900 REM *** DISPLAY GRID LIMITS (G) ***
2910 FOR G=12 TO 628 STEP 8:PSET (G,1),2:PSET (G,189),2:NEXT G
2920 FOR G=5 TO 185 STEP 4:PSET (12,G),2:PSET (628,G),2:NEXT G:GOTO 1000
3000 REM *** POPULATION HISTORY (H) ***
3010 CLS:MB=(TM>127)*(127-TM):MX=1:MN=4000:FOR G=MB TO TM
3020 I=G AND 127:IF HS(I)>MX THEN MX=HS(I)
3030 IF HS(I)<MN THEN MN=HS(I)

```



```

3040 NEXT G:ZX=(MX-MN)/167:IF ZX=0 THEN ZX=1
3050 FOR G=MB TO TM:I=G AND 127:J=(G-MB)*4+32
3060 LINE (J,167)-(J,167-(HS(I)-MN)/ZX),7,BF:NEXT G
3070 FOR I=164 TO 4 STEP -10:J=(164-I):SYMBOL (0,I),MID$(STR$(CINT(MN+ZX*J)),2),
1,1:NEXT I
3080 FOR I=MB TO TM STEP 12:G=I-MB:LOCATE 23,INT(G/2)+3,0:PRINT I;:NEXT I
3090 IF INKEY$="" THEN 3090 ELSE PT=USR3(0):GOTO 1000
3100 REM *** LOAD SCREEN COMMAND (L) ***
3110 LOCATE 25,33,1:INPUT(10);"Enter Load filespec: ",R$
3120 IF R$="" THEN 1000 ELSE INPUT(5);" Offset: ",E$
3130 I=VAL(E$):OPEN "I",1,R$
3140 IF EOF(1) THEN 3160
3150 INPUT #1,E$:G=VAL("&H"+E$)+I:IF G>3840 OR G<0 THEN 3140 ELSE A=USR1(G):GOTO
3140
3160 CLOSE #1:PT=USR3(0):GOTO 1000
3200 REM *** SAVE SCREEN COMMAND (S) ***
3210 LOCATE 25,35,1:INPUT(15);"Enter Save filespec: ",R$
3220 IF R$="" THEN 1000
3230 C=0:OC$=",,,,,,,,,"+CHR$(13):OPEN "O",1,R$
3240 FOR G=0 TO 3840:A=USR2(G)
3250 IF A THEN PRINT #1,HEX$(G)MID$(OC$,C+1,1);:C=C+1 AND 7:A=USR1(G)
3260 NEXT G:PRINT #1:CLOSE #1:GOTO 1000

```

Listing 2: Assembly Language Source Code

```

; *** NEWPOP=USR0(OLDPOP) ***
; ROUTINE TO ADVANCE SCREEN 1 GENERATION
USR0:  MOV     DX,[BX]                ;GET OLD POPULATION COUNT
        PUSH   DS
        MOV    AX,CS                ;SET UP SEGMENT REGISTERS
        MOV    DS,AX
        MOV    ES,AX
        MOV    SI,0000H             ;COPY NEWDATA TO OLDDATA
        MOV    DI,0FA0H             ;FOR USE AS REFERENCE
        MOV    CX,2000H
        REP    MOVSW
        MOV    SI,50H               ;START WITH FIRST VALID
        MOV    DI,DI               ;ELEMENT
        MOV    CX,0FA0H-0A0H
        MOV    AX,0F000H            ;SET ES TO POINT TO RED
        MOV    ES,AX               ;SCREEN
        MOV    AL,[SI+0FA0H]        ;GET OLDDATA VALUE
        CMP    AL,3                 ;CHECK FOR BIRTH
        JE     BIRTH
        TEST   AL,10H               ;CHECK IF LIFE UNIT
        JE     GEN2                 ;PRESENT (JUMP IF NO)
        CMP    AL,12H               ;CHECK IF SURVIVAL
        JE     GEN2                 ;IS SATISFIED
        CMP    AL,13H
        JE     GEN2
        DEATH: DEC    BYTE PTR [SI-51H] ;ADJUST ALL NEIGHBORING
        DEC    BYTE PTR [SI-50H]        ;CELLS FOR DEATH
        DEC    BYTE PTR [SI-4FH]
        DEC    BYTE PTR [SI-1]
        DEC    BYTE PTR [SI+1]
        DEC    BYTE PTR [SI+4FH]
        DEC    BYTE PTR [SI+50H]
        DEC    BYTE PTR [SI+51H]
        AND    BYTE PTR [SI],0FFH-10H ;TURN OFF LIFE UNIT AND
        XOR    AX,AX                ;ERASE FROM SCREEN
        STOSW
        STOSW
        DEC    DX                    ;ADJUST POPULATION COUNT

```


1F95 80 E6 7F
 1F98 EB 2A
 1F9A FE 44 AF
 1F9D FE 44 B0
 1FA0 FE 44 B1
 1FA3 FE 44 FF
 1FA6 FE 44 01
 1FA9 FE 44 4F
 1FAC FE 44 50
 1FAF FE 44 51
 1FB2 80 0C 10
 1FB5 B8 3C3C
 1FB8 AB
 1FB9 AA
 1FBA 47
 1FBB 42
 1FBC 80 E6 7F
 1FBD EB 03
 1FC1 83 C7 04
 1FC4 46
 1FC5 E2 00
 1FC7 1F
 1FC8 89 17
 1FCA CB

AND DH,7FH
 JMP SHORT GEN3
 BIRTH: INC BYTE PTR [SI-51H]
 INC BYTE PTR [SI-50H]
 INC BYTE PTR [SI-4FH]
 INC BYTE PTR [SI-1]
 INC BYTE PTR [SI+1]
 INC BYTE PTR [SI+4FH]
 INC BYTE PTR [SI+50H]
 INC BYTE PTR [SI+51H]
 OR BYTE PTR [SI],10H
 MOV AX,3C3CH
 STOSW
 STOSB
 INC DI
 INC DX
 AND DH,7FH
 JMP SHORT GEN3
 GEN2: ADD DI,4
 GEN3: INC SI
 LOOP GEN1
 RETBAS: POP DS
 MOV [BX],DX
 RET

;ZERO STABLE FLAG
 ;ADJUST ALL NEIGHBORING
 ;CELLS FOR BIRTH
 ;TURN ON LIFE UNIT
 ;DISPLAY ON RED SCREEN

;ADJUST POPULATION COUNT
 ;ZERO STABLE FLAG

;LOOP FOR ENTIRE FIELD

;RETURN DX TO BASIC
 ;VIA USR ADDRESS

;SET A PIXEL USR1(X LOC + Y LOC *80) RETURNS 1 IF SUCCESSFUL

;GET LOCATION OF PIXEL
 ;SAVE DS

1FCB 8B 07
 1FCD 1E
 1FCE 8B F0
 1FD0 D1 E0

USR1: MOV AX,[BX]
 PUSH DS
 MOV SI,AX
 SHL AX,1
 ;FIND SCREEN ADDRESS

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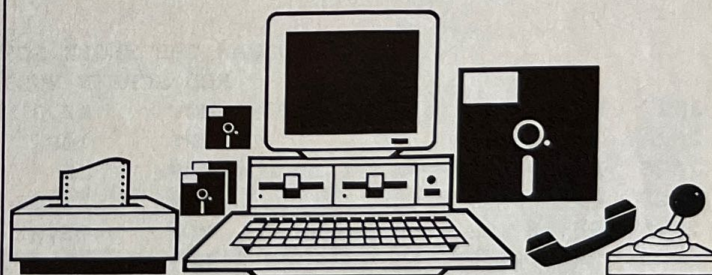
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```

1FD2 D1 E0      SHL      AX,1      ;4 * PIXEL ADDRESS
1FD4 8B F8      MOV      DI,AX
1FD6 83 C6 50    ADD      SI,50H    ;SET PARAMETERS FOR JUMP
1FD9 8C C8      MOV      AX,CS      ; TO BIRTH
1FDB 8E D8      MOV      DS,AX      ;RED SCREEN LOCATION
1FDD B8 F000     MOV      AX,0F000H
1FE0 8E C0      MOV      ES,AX
1FE2 B9 0001     MOV      CX,1
1FE5 33 D2      XOR      DX,DX
1FE7 F6 04 30    TEST     BYTE PTR [SI],30H ;CHECK IF VALID POSITION
1FEA 74 AE      JE        BIRTH      ; YES
1FEC EB D9      JMP      SHORT RETBAS ; NO, RETURN TO BASIC

;
;RESET A LIFE UNIT  USR2(X LOC + Y LOC *80)  RETURNS 32767
USR2: MOV      AX,[BX]      ;GET SCREEN POSITION
      PUSH     DS
      MOV      SI,AX
      SHL      AX,1
      SHL      AX,1
      MOV      DI,AX
      ADD      SI,50H
      MOV      AX,CS
      MOV      DS,AX
      MOV      AX,0F000H
      MOV      ES,AX
      MOV      CX,1
      XOR      DX,DX
      TEST     BYTE PTR [SI],10H    ;CHECK IF VALID LIFE UNIT
      JE        RETBAS              ;NO, RETURN TO BASIC
      JMP      DEATH                ;YES

;
;CLEAR THE SCREEN AND REDRAW IT  USR4(0)
;
USR4: PUSH     DS
      MOV      AX,CS
      MOV      DS,AX
      MOV      SI,0000H
      MOV      CX,0FA0H
      ZEROL: AND WORD PTR [SI],2020H ;ERASE EVERYTHING BUT BORDERS
      ADD      SI,2
      LOOP     ZEROL
      POP      DS
      ;ERASE WHOLE SCREEN BUFFER
      ;GO ON TO REDRAW ROUTINE

;
;REDRAW THE WHOLE SCREEN  USR3(0)  -> RETURNS LIFE COUNT
; RED SCREEN MUST BE CLEARED PRIOR TO USE!!
USR3: MOV      AX,3
      INT      10H
      PUSH     DS
      MOV      AX,CS
      MOV      DS,AX
      MOV      AX,0F000H
      MOV      ES,AX
      XOR      DI,DI
      MOV      DX,DI
      MOV      SI,0050H
      MOV      CX,0FA0H-0A0H
      DRAW1: TEST BYTE PTR [SI],10H ;CHECK IF UNIT ON
      JE        DRAW2
      MOV      WORD PTR ES:[DI],3C3CH ;NO, SKIP
      MOV      BYTE PTR ES:[DI+2],3CH ;YES, DRAW
      INC      DX
      DRAW2: ADD DI,4
      INC      SI
      LOOP     DRAW1
      JMP      RETBAS
      ;DO REST OF BUFFER

2000 B8 F000     MOV      AX,0F000H
2003 8E C0      MOV      ES,AX
2005 B9 0001     MOV      CX,1
2008 33 D2      XOR      DX,DX
200A F6 04 10    TEST     BYTE PTR [SI],10H ;CHECK IF VALID LIFE UNIT
200D 74 B8      JE        RETBAS              ;NO, RETURN TO BASIC
200F E9 1F75     JMP      DEATH                ;YES

2012 1E
2013 8C C8
2015 8E D8
2017 BE 0000
201A B9 0FA0
201D 81 24 2020
2021 83 C6 02
2024 E2 F7
2026 1F

2027 B8 0003
202A CD 10
202C 1E
202D 8C C8
202F 8E D8
2031 B8 F000
2034 8E C0
2036 33 FF
2038 8B D7
203A BE 0050 R
203D B9 0F00
2040 F6 04 10
2043 74 0B
2045 26: C7 05 3C3C
204A 26: C6 45 02 3C
204F 42
2050 83 C7 04
2053 46
2054 E2 EA
2056 E9 1FC7 R

```


TIME BANDIT Bill Dunlevy & Harry Lafnear

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192K Sanyo 550/555, Joystick recomm . **\$34.95**

PLEDGE

by Jon Kring

Once the financial staff at your church tries PLEDGE, they'll vow never to go back to pen and paper. This new pledge-tracking program will take hours off recording donations, preparing reports, and mailing statements.

PLEDGE requires no computer knowledge and comes with friendly instructions. Data entry is a snap; easy-to-understand screens aid the user in typing data. Just a few keystrokes produce any of five neat, detailed reports: member rosters, pledge summary, collections, pledge vs. given, and year-to-date summary.

128K Sanyo 550/555, IBM compatible . **\$199.95**

TYPE RIGHT

by Ken Olson

Whether you want to end the fumbling of hunt-and-peck typing, or simply improve your speed and accuracy, TYPE RIGHT is the answer. Learn touch-typing in a way that ends computer anxiety and keyboard fears. Written in MACHINE LANGUAGE to be fast and accurate, TYPE RIGHT never misses a key. Color graphics and large letters make TYPE RIGHT perfect for any age! Learn at your own pace; repeat a previous drill, or forge ahead to sample paragraphs. TYPE RIGHT offers friendly, menu-driven use, and keeps track of everyone's personal progress.

128K Sanyo 550/555 **\$34.95**

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A utility that creates a menu of BASIC filenames from disk

BASIC Menu

By Ray C. Robinson

Wouldn't it be nice if a BASIC program could read all of the BASIC filenames directly from a disk, present them in a numbered menu for your selection and prompt patiently for your input? Think about

(Ray Robinson is an electronics technician with the FAA, holds a BA degree in business administration, and has been interested in home and personal computers since 1980. He may be contacted at Rt. 8, Box 725, Lake Charles, LA 70605; 318-474-5301.)

it, no more manual updating of the menu when you add or delete files; the BASIC program would do all the work for you. Well, a BASIC program by itself can't do it, but one linked to a machine language program can, and that is exactly what MENU.BAS can do for you.

The heart of MENU.BAS is the USR function on Line 140. This function executes a machine language program which first searches through all the filenames on the disk, builds a buffer of filenames that have the extension .BAS and finally passes the list back to BASIC in the string variable A\$. The

number of BASIC filenames found is stored in memory and is passed to BASIC indirectly with the N=PEEK(3) statement. Listing 2 is the assembler source code that generated the object code used by the menu program.

The menu program is designed to work with MS-DOS version 2.11 and either Sanyo BASIC or GW-BASIC with the Video RAM Board.

Begin by typing in the BASIC program from Listing 1, using special care with the DATA statements on lines 350 through 410. These DATA statements make up the machine language code and an error here could spell disaster when the program is run. When you are sure the program is error free, save it under the name MENU.

If you have a Video RAM Board and want a version for GW-BASIC, save the program with the ASCII option (i.e., SAVE "MENU",A Then from DOS, put a copy of MENU.BAS on a disk that contains the video board system and GW-BASIC. Boot the system with this video board disk and from GW-BASIC, load the menu program and make the

Listing 1: MENU.BAS

```
1 '*****
2 '*          BASIC MENU PROGRAM          *
3 '* BY RAY C. ROBINSON, LAKE CHARLES, LA. JULY 1985 *
4 '*****
5 '
6 '
7 10 CLEAR 67
8 20 COLOR 6,0
9 30 CLS
10 40 M$="*****BASIC MENU PROGRAM*****"
11 50 PRINT TAB(20) M$
12 60 PRINT:PRINT TAB(26) "ONE MOMENT PLEASE"
13 70 DEFINT I,H,V
14 80 RESTORE 350
15 90 FOR I=0 TO &H2:READ CF$:POKE I,VAL("&H"+CF$):NEXT
16 100 FOR I=&HFC TO &H107:READ CF$:POKE I,VAL("&H"+CF$):NEXT
17 110 FOR I=&H1A1 TO &H1FD:READ CF$:POKE I,VAL("&H"+CF$):NEXT
18 120 DEF USR(A$)=0
19 130 A$=STRING$(248,32)
20 140 A$=USR(A$):N=PEEK(3):A$=LEFT$(A$,N*8)
21 150 DIM CH$(33)
22 160 CH$(1)="EXIT TO DOS":CH$(2)="EXIT TO BASIC"
23 170 FOR I=1 TO N:CH$(I+2)=MID$(A$,I*8-7,8):L=INSTR(CH$(I+2)," ")
24 180 IF L=0 THEN 200
25 190 CH$(I+2)=LEFT$(CH$(I+2),L-1)
26 200 NEXT
27 210 CLS:PRINT TAB(20) M$
28 220 K=-11
29 230 FOR H=1 TO 41 STEP 20
30 240 K=K+11
```


following changes to lines 10 and 20:

```
10 DEF SEG=4096
20 KEY OFF:SCREEN 0,0,0:COLOR
6,0,0:WIDTH 80
```

Change the fifth data statement in Line 360 from 02 to 01 so that it reads:

```
360 8B,DA,8B,5F,01 . . .
```

Save the corrected program without the ASCII option and your GW-BASIC version of MENU is ready to go.

The disk with the original Sanyo BASIC version of MENU is still in ASCII format, so boot the system with this disk and from Sanyo BASIC, load the MENU program and then save it without the ASCII option. Saved this way, the menu program will load faster and take up less disk space.

Now that all the hard work is done, put a copy of MENU.BAS on a disk that contains some of your favorite BASIC programs and run *Menu*. You can do this directly from DOS by typing BASIC"MENU for Sanyo BASIC or BASIC MENU (no quote) for GW-BASIC. When the MENU program runs, "BASIC Menu Program" and "One Moment Please"

will appear on the screen, the disk will fire up, and the numbers one to 33 and BASIC filenames will be printed on the screen. The whole process takes two to five seconds, depending on how many BASIC filenames are found. To run the BASIC program of your choice, simply enter its menu number and press ENTER and the program will load and run automatically.

The first two menu choices will always be: "Return to DOS" and "Return to BASIC." With these choices available, all you need to do to your BASIC program listings is to change all END statements to RUN"MENU, then when your program ends it will return to the menu and you can either run another program or exit as you desire.

The maximum number of BASIC filenames the *Menu* program can handle is 31 and if your disk contains more names than this, they will just be ignored. You can open a slot in the menu by giving the MENU.BAS program a different file extension. For example, from DOS type: RENAME MENU.BAS MENU.MEN. Now the menu program will

not appear in the menu but it isn't needed there anyway. If you do this though, you must use the full name MENU.MEN when you wish to run the program or replace the END statement in your program listings. This same technique could be used to hide any other basic filenames that do not need to appear on the menu.

Program Explanation

10 to 110	Clear memory and load machine language program at current DEF SEG.
120 to 200	Call machine language USR program and put BASIC filenames into array CH\$().
210 to 340	Display menu of BASIC filenames, prompt for input and execute selection.
350 to 410	Data for machine language.

```
250 FOR V=1 TO 11
260 LOCATE V+3,H,0:PRINT USING "## &          &";V+K;CH$(V+K)
270 NEXT V
280 NEXT H
290 LOCATE 20,25,1:INPUT "YOUR CHOICE";CH$:C=VAL(CH$)
300 IF C<1 OR C>N+2 THEN BEEP:LOCATE 20,38:PRINT "          ":GOTO 290
310 IF C=1 THEN 320 ELSE IF C=2 THEN 330 ELSE 340
320 SYSTEM
330 END
340 RUN CH$(C)
350 DATA E9,9E,01,00,3F,3F,3F,3F,3F,3F,3F,3F,42,41,53
360 DATA 8B,DA,8B,5F,02,1E,53,06,0E,0E,1F,07,32,E4
370 DATA 2E,88,26,03,00,BA,21,01,B4,1A,CD,21,BA,FC,00,B4
380 DATA 11,CD,21,3C,FF,74,2B,BB,04,00,2E,FE,06,03,00,BE
390 DATA 22,01,8B,FB,FC,B9,04,00,F3,A5,83,C3,08,BA,FC,00
400 DATA B4,12,CD,21,3C,FF,74,0A,2E,A0,03,00,3C,1F,74,02
410 DATA EB,D8,07,5F,BE,04,00,FC,B9,7C,00,F3,A5,1F,CB
```

Listing 2: Assembly Language Source Code

```
BASDIR SEGMENT
MAIN PROC FAR
    ASSUME CS:BASDIR
START:    JMP     MENU
COUNTER  DB      0                ;NO. OF .BAS FILENAMES
BUFFER2   DB      248 DUP(?)      ;.BAS FILENAME BUFFER
FCB       DB      0,"???????BAS" ;FILE CONTROL BLOCK
         DB      25 DUP(?)
         DB      0                ;DISK TRANSFER ADDRESS
BUFFER1   DB      0
PROGNAME  DB      127 DUP(?)

MENU:     MOV     BX,DX            ;BX NOW POINTS TO BASIC ARRAY
         MOV     BX,02[BX]        ;LOCATION PASSED BY USR CALL
```



```

PUSH DS      ;
PUSH BX      ;SAVE CONTENTS OF DS,BX,&ES
PUSH ES      ;

PUSH CS      ;
PUSH CS      ;CS,DS,&ES NOW ALL SAME SEGMENT
POP  DS      ;
POP  ES      ;

XOR  AH,AH    ;
MOV  [COUNTER],AH ;CLEAR COUNTER

MOV  DX,OFFSET BUFFER1 ;FUNCTION 1AH
MOV  AH,1AH    ;SET DISK TRANSFER ADDRESS
INT  21H      ;

MOV  DX,OFFSET FCB   ;FUNCTION 11H
MOV  AH,11H    ;SEARCH FOR FIRST .BAS FILENAME
INT  21H      ;

CMP  AL,0FFH      ;.BAS FILE FOUND?
JE   DONE         ;NO-NO .BAS FILES ON DISK, EXIT

MOV  BX,OFFSET BUFFER2 ;BX POINTS TO BUFFER2

AGAIN: INC  BYTE PTR COUNTER ;ADD ONE TO NAME COUNTER

MOV  SI,OFFSET PROGNAME ;
MOV  DI,BX             ;MOVE .BAS FILENAME TO BUFFER2
CLD                     ;
MOV  CX,4              ;
REP  MOVSW             ;

ADD  BX,8              ;BX POINTS TO NEXT FILENAME LOCATION
                        ;IN BUFFER2

MOV  DX,OFFSET FCB    ;FUNCTION 12H
MOV  AH,12H           ;SEARCH FOR NEXT .BAS FILENAME
INT  21H              ;

CMP  AL,0FFH          ;.BAS FILENAME FOUND?
JE   DONE              ;NO, EXIT PROGRAM
MOV  AL,[COUNTER]      ;
CMP  AL,31             ;31 FILENAMES YET?
JE   DONE              ;YES, EXIT PROGRAM
JMP  AGAIN             ;NO, FETCH ANOTHER NAME

DONE: POP  ES          ;
      POP  DI          ;RESTORE REGISTERS AND MOVE
      MOV  SI,OFFSET BUFFER2 ;BUFFER2 TO BASICS STRING LOCATION
      CLD              ;
      MOV  CX,124       ;
      REP  MOVSW        ;

      POP  DS          ;RESTORE DS
      RET              ;RETURN TO BASIC

MAIN ENDP
BASDIR ENDS
      END  START

```


REVIEWS



Software review

Dear Word — A Word Processor For A Sweet Price

Dear Word is an amazingly inexpensive yet capable word processor for the Sanyo MBC-550/555 and other IBM-compatible computers. It was tested on a Sanyo MBC-555 and a Citizen MSP-10 parallel printer.

I first wondered why anyone with a Sanyo and its bundled *WordStar* would ever want another word processing program. To my surprise, I found *Dear Word* working its way into many of my everyday working disks.

The program resides in only 27K of RAM. Quite an accomplishment for a full-featured word processor. This makes *Dear Word* easy to fit on a working disk that could use a word processor but is short on room. I use it as the resident word processor on my *Fancy Font* disk, for example. Honeybit Software wisely decided not to copy protect the program, so it can easily be tucked away on many working disks.

Dear Word is incredibly fast at everything. It is written in tight code which really makes it "fly." It allows renaming documents and deleting disk files from within a document — a lifesaver if you're out of disk space.

The program includes several features which are very handy for programmers. Files are easily converted back and forth from *Dear Word* to ASCII format. Entire paragraphs of text can be moved right and left for indentions such as subroutines in programs written in structured languages like *dBASE*.

The print options are somewhat limited, and not all control codes are available. Most of the features of my printer, which uses Epson codes, were supported.

The most amazing feature of the program is its price; only \$15 by mail order from the publisher. The documentation comes as a 28-page *Dear Word* text file on disk that must be printed out.

(Honeybit Software 5430 S.W. Helen Ave., Corvallis, OR 97333, 503-754-9124, \$15)

— Stephen W. Baker

Software review

Forbidden Temple — An Ongoing Adventure

Forbidden Temple is a text Adventure. When the game opens, the first item on the agenda is to create "characters" — as many as desired. A "group" of between one and three is chosen, and the characters are given gold to buy weapons, armor, spells and potions. The group then enters the dungeon and moves around looking for monsters, which may be engaged in battle. Most of the monsters carry gold and a few carry special "orbs." When a group of monsters is killed, their goods are divided among the "good guys." The ultimate goal is to find all of the orbs, and to find a hidden door which will then unlock.

Graphics are displayed in a small "window" which shows the area of the dungeon just in front of the group of good guys. Most of the time, this contains a cryptic sketch of part of a hall which shows things like doors and corners. When monsters are engaged, the window shows a still picture of one of them — they are pretty ugly. The action is typical of text Adventures. When fighting, for example, each player is asked which monster he wants to aim for and the result is shown. The results of each monster's shot are then shown and the cycle repeats.

If the group manages to get out of the dungeon, the living members' gold is saved to disk and is available to those characters the next time the game is played. Also, when an orb is found, this fact is saved to disk. I like this feature of the game. At first, the characters do not have enough gold for more than one small weapon and no armor. As gold is accumulated, more effective items can be purchased, which changes the style of play. Progress is slow; it takes many hours to put a really effective team together.

Forbidden Temple is written in BASIC and run on a standard interpreter. This has advantages and disadvantages. The disadvantages are that the program requires 256K and loads slowly. It takes approximately four minutes for the interpreter to be called, the program loaded and the monster data files accessed. The advantage is that the source code is available, thus allowing the user to tinker with the program. For example, I didn't like the way some of the colors looked on my monochrome monitor, so I changed the COLOR statements. The availability of the source code and the interpreter also allows the user to cheat, but I won't go into that (my conscience bothers me too much).

I did not encounter any errors in the program (other than a few misspelled words), but there are a number of features I didn't like. There is some error trapping, but it is not complete. In setting up a group, for example, if the user enters the name of a character not yet created (or misspells a name), the program aborts, requiring the whole program to be restarted — this takes almost three minutes (unless the user knows enough BASIC to correct it in direct mode).

There are a few unnatural features. Sometimes, for instance, a character is asked if he wants to use a weapon or spend some gold not yet possessed. When a good guy

is killed, his gold is divided among the remaining members of the group. The gold the player had before that session, however, is still available on the disk for future sessions. Thus, the total holding of a group can be increased through the "death" of one of its members. Also, when expensive healing potions are purchased, the program deletes any potions the character already has.

The dungeon is very big, with lots of side passages and hallways. I found myself spending a lot of time wandering around looking for monsters.

Fighting is fun, but looking isn't. However, the size of the dungeon is a definite plus. It makes the game interesting — there are few things in life more frustrating than killing a whole bunch of monsters, getting lost in the maze and not being able to escape with the loot. The solution, I think, is to have more monsters.

Finally, the documentation is very good. The first page tells a story about how the world got to be the way the game says it is. It reads like the beginning of a continuing fantasy novel. The remaining few pages give a concise and clear account of the game and some advice.

(Prickly-Pear Software, 2640 N. Conestoga Ave., Tucson, AZ 85749, 602-749-2864, \$39.95)

— Stewart Shapiro

Software review

SanyCad — A Program For Play or Professionals?

SanyCad is a Sanyo-only computer-assisted drawing or drafting program which may well be suitable not just for hobbyists and those of artistic inclinations, but for more professional users as well. At least such is the outlook of Computer Associates in its release for this interesting software package, which is perhaps best described as a cross between a drawing or painting program, on the one hand, and a professional drafting program on the other. Indeed, after reviewing it, I still can't make up my mind as to which is the better description.

With *SanyCad*, as with other drawing programs, you can create lines, circles, arcs, boxes, paint in regions, and so on, either in color or shades (the latter for us poor cheapskates still using a monochrome monitor). The documentation helpfully repeats the instructions for resetting the infamous four DIP switches for proper use of color shades with a monochrome monitor. With a screen dump such as MichTron's *Freeze Frame* — the one cited in the documentation and which I happened to have a review copy of — you can make hard copy printouts of your creations. I found, as you will find with most screen dumps, there is some problem associated with circles and dimensions, but I don't think I can fault *SanyCad*. Moreover, Computer Associates explicitly suggests experimenting with a "printer ratio" so as to get an appropriate image from the screen onto paper.

The copy that I received consisted of two single-sided diskettes and a manual of about 30 pages. The first disk contains the main programs, and the second contained some small pictures which had been saved. Although small, these little images or overlays can be superimposed to create more impressive and involved drawings, particularly in conjunction with some powerful commands for moving and duplicating found on the drawing menu.

Using A-OK DOS 1 and single-sided drives, I was able to create an MS-DOS 1.25 system disk with BASIC and all the programs, as well as the overlays, as A-OK supports nine sector per track formatting. I mention this for three reasons: 1) You need not feel that two drives are needed. 2) You need not feel that you need a double-sided drive. 3) You can fit all the programs on a single disk with 180K. In any event, the transfer was easy enough (the most important and unusual thing was in copying *Freeze Frame*), and with the AUTOEXEC.BAT batch file, I had a self-booting system disk. With the menu structure of *SanyCad*, I just followed a few directions, and was then ready to begin.

First, I used the on-screen tutorial, which provided me with most of what I needed to know. True, I made a few mistakes, but I can't fault the software. The program responds as quickly as can be expected from a BASIC program involving graphics. The manual filled in some gaps and was adequate documentation-wise, although there are several typos or other grammatical errors which could use touching up. As for the rest of the package, there is

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a warning about the licensing agreement and not opening the package if you cannot or will not respect the copyright and licensing. The software is not copy protected, although as it stands, the program is not listable. The manual does offer a friendly tone of willingness to help, and Computer Associates will call you back if it has to research a question for you.

One additional feature of *SanyCad* is a BASIC subroutine to allow you to use pictures you create and save in your BASIC programs. At review time, I did not have time to check this, but it seems like a nice extra. Of course, you can just SAVE and LOAD pictures using *SanyCad*, as I anticipate most people will do.

In actual use, you have access to a main menu of options, and a drawing submenu. One particular feature with which I was impressed is the ability to undo the last action. For instance, if you just added a line which you now decide you don't like, you can erase it. Sometimes, this erases part of something overlapping, but you can have *SanyCad* redraw the picture. You can magnify shapes, duplicate them and even move them. You can add text — courtesy of Sanyo BASIC's SYMBOL command. There is windowing capability and room for 24 screens in memory on a 256K machine. I like being able to use the arrow keys to move about the menus at the bottom of the screen, although the first letter of the command was often faster. I was sorry that a joystick is not supported. Other drawing programs, such as SoftSol's *Draw 'N Doodle*, allows toggling between the keyboard and a joystick. Still, it was not too inconvenient to use the keyboard, primarily the arrow keys to direct the crosshairs cursor.

One nice little extra, which I will have to try with other programs, is the use of the tab key (that's the key with the left and right arrows on it) to toggle between moving the cursor one pixel or eight pixels at a time. I was disappointed to see that, after virtually every action, it kept defaulting to one pixel, as this is very slow movement, and I'm an impatient sort.

There are other features which I have not touched on, such as the use of dimensioning (e.g. for drafting), but one can never cover everything in a small review like this. The most important question is whether you should buy it. This returns us to whom this is intended for. If you are only interested in some hobby play, a hundred bucks is a bit steep for the privilege. Honestly, it was fun. And true, *SanyCad* has some nice features not found in the less expensive offerings (such as the aforementioned *Draw 'N Doodle*), but I cannot say, with clear conscience, that they would justify spending more than perhaps \$50. So, I would have to incline toward recommending this program for those who might use the program more professionally; some kind of art, drafting or the like. For them, the program will be helpful in their professional endeavors.

(Computer Associates, Inc., Box 683, West Fargo, ND 58078, 701-281-0549, Sanyo MBC-550/555 with at least 192K, 256K recommended; \$99.95)

— Dr. Michael W. Ecker

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Fancy Font — A Touch Of Class

Fancy Font, a collection of programs and character sets developed by Soft Craft, Inc., provides you with the ability to get superb printing quality from a dot matrix printer. It also provides you with the ability to edit existing data sets or create new character data sets based on the particular requirements. When using this program you will find the output produced is fine letter quality resembling a typeset document, as opposed to a document printed on a dot matrix printer. Another capability provided is flexibility, which allows the user to create special characters required for company logos and technical documents which require unique symbols.

The package comes with existing character sets and works in conjunction with word processors, text editors and spreadsheet applications that produce standard ASCII files. This package is designed to work with the following printers: Epson FX and MX versions; IBM Graphics printer; Star Gemini-10X, 15X, Radix; Delta; NEC8023; and C.Itoh Prowriter. It runs under MS-DOS, requires 128K of memory and a minimum of 120K of disk storage.

Should you decide to purchase a copy of *Fancy Font*, you would receive two double-sided disks and the documentation. The disks contain the installation files for use if necessary. I did not require them. In addition to the installation files, there are help files, the executable programs *Pfont*, *Efont* and *Cfont*, a database of Hershey characters and various font files. The Hershey Character Database is a set of characters created by Alan V. Hershey for the National Bureau of Standards (Wolcott, NBS Special Publication No. 424). As stated in the documentation user manual, the font files provided are: Roman Subscript and Superscript 8 point; Roman 10, 12, 14, 18 and 24 points; Roman Italic and Bold 12 point; Old English 20 point; Script 20 point; and Special Characters 20 points.

In addition to the floppies, you will also receive one well-written user's manual, one quick reference card, a directory of files on each disk pack and two pamphlets. One defines the system requirements, a "getting started" tutorial, setting up requirements, examples and a guide

to "trouble shooting." The other pamphlet is a library of additional utilities and fonts available for purchase.

The heart of *Fancy Font* consists of three programs *Pfont*, *Efont* and *Cfont*. *Pfont* is used for printing. It has three methods of operation; Interactive, Command Line and Parameter Input File. *Efont* is used to simply create new characters or to create new characters from existing fonts. *Cfont* allows the user to choose characters from the Hershey Database and map them to ASCII character codes to construct a font character set for use with the other *Fancy Font* programs.

Pfont is the primary program of the three. Basically, this program formats print text for a dot matrix printer. The input can come from a text file or interactively from the keyboard. Commands can be specified as a parameter for printing or they can be embedded in the body of the report. Some examples are:

- 1) *Pfont* tty: +fo romn12 — This command instructs *Pfont* to use the typewriter feature where each line you type will be printed immediately using the Roman 12-point font.
- 2) *Pfont* sample.ff +fo romn12 — This command instructs *Pfont* to print the file sample.ff using Roman Italics 12-point font.
- 3) To use embedded commands, first create a file on your favorite word processor like this:

\foThis line is an example \f1 of embedded commands \f2 printing different fonts.
Save this file and then execute it using the print parameters specified as follows:

Pfont sample.ff +fo romn18 olde20 scrp20
Pfont is executed using sample.ff text file created by the word processor.

\fo told *Pfont* to print "This line is an example" using Roman 18-point font.
\f1 told *Pfont* to print "of embedded commands" using Olde English 20-point font.
\f2 told *Pfont* to print "printing different fonts" using Script 20-point font.

The Print Control Parameters provide the capability to use: font selection, rough draft, display text to screen as opposed to printer, print control parameters, page setup parameters, horizontal and vertical formatting and

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parameters used for concatenating files and building strings of text. The Embedded Formatting Commands provide for font selection, format control, horizontal and vertical motion, character substitution, reverse background and comments.

Efont is used to create new characters or to edit existing fonts. *Efont* can be used to create company logos or other special graphics features. It can also be used to create foreign characters or accents. All *Efont* commands are single letters; they allow you to L-load a font, S-save a font, E-edit a set of characters, R-replace a set of characters, P-print characters and D-display characters on the CRT. T-test a font by printing it, Z-zap remove characters from the font, M-modify margins of a range of characters, V-specify a value to move characters up or down, A-display and modify font information and Q-quit.

The basic operating sequence is to: Create a text file for a character using the *Efont* edit commands, exit *Efont* and edit the character using a text editor or word processor and return to *Efont* and replace the original character with the modified characters.

Cfont is used to take existing characters from the Hershey database and map them to ASCII character codes to use with existing *Fancy Font* programs. The *Cfont* command interface is the same as *Efont*. All command names are single letters. Immediately upon entering the commands, the program prompts the user for any additional parameters required. The list of commands is: M-enter mappings from the Hershey Database, S-save the current mappings, L-load a set of mappings, Z-zap current mappings, G-generate a font with current mappings, F-set the scale factors for enlargement/reduction, B-set the baseline of the characters to be generated, P-print a range of Hershey characters and D-display the current mapping, scale factors and baselines.

The basic operation instructions for *Cfont* are: Execute *Cfont*, use the M command to begin mapping and *Cfont* then asks for the character the Hershey Character should be mapped to. This must be supplied in ASCII Code Decimal Equivalent. ASCII code conversions are found in Appendix eight of the user manual. *Cfont* then asks for the Hershey character. This must also be given in

decimal equivalent. The complete Hershey Character Database is found in Appendix six of the user manual. The final step is to execute the G-generate command. This replaces the normal character with the Hershey character. Now when the font is used with *Pfont*, the Hershey character appears each time the assigned key of the character font is entered.

The user manual is well-written and contains all the information a user requires to understand *Fancy Font*. It contains explicit instructions for printing with fonts, editing fonts and creating fonts. The appendix consists of a glossary, font descriptions and samples, using fonts with word processors, error messages for each program, distribution file descriptions, Hershey database, data file formats, ASCII conversions and parameter and command summary.

Fancy Font is a powerful program that provides much flexibility for any user. However, because of its power and flexibility, it does require a learning curve. This does not mean the package is complicated or difficult to work with. However, it does mean that time will be required to master its many capabilities. The tutorial (supplied by the package) to get you started, only touches on the basics of this package, but it does get you thinking in the right direction. The user's manual explains each command and parameter of the three programs using the same format which is; the command or parameter, its usage, values used if any, examples and notes. The manual is consistent and complete and provides many examples. If an in-depth tutorial were supplied that tied the manual and the "getting started" tutorial together, this package would become easier to learn.

In summary, if you have a need for a powerful package that can produce output on your dot matrix printer that resembles typeset and have a need to type technical papers requiring special characters, then you should consider this package. It does work well and it becomes easy to use with some practice.

(Soft Craft, Inc., 222 State Street, Suite 400, Madison, WI 53703, 608-257-3300, \$180)

— John E. Schlosser



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High Resolution Daisy Wheel Graphics

By Mick and Jon McGuire

If you have a daisy wheel printer that allows variable horizontal and vertical spacing, you can dump your screen to your printer and get very nice graphics and enlarged text on paper.

Graphs, charts and just about anything else on screen can be dumped to your daisy wheel printer if your printer has a programmable Horizontal Motion Index (HMI) and Vertical Motion Index (VMI). Not all daisy wheel printers can do this, but most of the newer ones have this feature. My Silver-Reed EXP-400 printer, which was very inexpensive, has variable HMI and VMI. Different

printers use different methods to

set HMI and VMI, so you may want to modify the listings with this article to accommodate your particular printer. Consult your printer manual for details.

That was the good news. The bad news is that the process is very slow! It takes a long time to scan and decode the screen, and it takes the daisy wheel printer a long time to print all those dots necessary for the graphics. In the graph and star figures used as illustrations (Figures 1 and 2), the time necessary to dump the screen to the printer was almost equally divided by the scan and print sections of the programs. The MBC-550/555


has a high resolution screen which requires that 640 lines, each 200 characters long, must be

scanned to dump a full screen. Given the slow speed of a BASIC scan and the slow print speed, you can see why it takes a long time.

Theoretically, at a print speed of only 10 CPS, a full screen printout should take three and one-half hours, but in fact, it requires a lot less time due to the fact that my printer does not pause to "print" spaces, only formed characters (periods in this case). A really dense graphics screen printout will take a very long time, but most of my full screen prints average 15 to 45 minutes per screen. It's not as bad as it sounds, but you must realize that the speed of your particular printer will partially determine how long your screen dumps will take.

You should use a good fabric ribbon with your printer. A few screen dumps, each with thousands of pixels to be represented on paper by periods, will rapidly use up a film or regular multi-strike ribbon. If you can live with slowpoke dumps and can use fabric ribbons, you should be able to make some very high quality copies of what you see on your screen.

To get around the time problem to some extent, I usually send only a portion of the screen to the



(Mick McGuire has been writing computer-related magazine articles since 1979 and is familiar with operation and programming on 13 different computer systems. He and his son Jon may be contacted at 2234 George Wythe Rd., Orange Park, FL 32073, 904-272-5596.)

printer. Time is not wasted scanning and printing "empty space." An entire screen *can* be printed, but this is usually not needed or desired. The sample illustrations (Figures 1 and 2) took seven and 22 minutes to print. If you plan on doing a lot of screen dumps or are the impatient type, save your dimes, quarters and dollars and buy a high speed dot matrix or ink jet printer. On the other hand, if you need high quality screen dumps only "once in a blue moon," use your daisy wheel and save that money for something else.

You can cut the required time almost in half if you use a machine language scan of the screen, but I did not include one as I wanted the programs presented here to be understandable and easily modifiable for other computers as well as the Sanyo series computers.

Physical Constraints

One thing to consider before starting: Will a full screen dump fit on a standard sheet of paper? How wide is your printer platten? With my printer, which has a short platten and can only print eight-inch lines, a full screen dump from my Sanyo MBC-550 will not fit. As I stated earlier, the Sanyo has a screen which is 640 pixels wide. Through trial and error, I learned that I needed a printer capable of printing a 13.4-inch line, or I had to figure a way to print the screen sideways. Since the screen is only 200 pixels high, I decided to scan the Y axis instead of the X for each printed line. The only drawback to this is that I lost some flexibility as there is less control of the VMI, since it is variable in increments of $\frac{1}{48}$ inch as opposed to $\frac{1}{120}$ inch for the HMI. There is a positive side effect in that the vertical scan of 200 pixels is easily converted into a string whose length is under the maximum allowed for a "normal" string variable (255). That means that each scan can be represented by a single variable instead of the three it would take to store a horizontal scan.

Program Listing 1

Listing 1 is a sample program which will draw and dump the star shape found in Figure 1. Lines 10 through 135 will draw the star, and lines 10000 through 10110 will scan the screen area that the star occupies and send it to the printer. Lines 5 and 145 will keep track of how long the whole process takes. The HMI and VMI controls, found in lines 10010 and 10020, are for a Silver-Reed EXP-400

daisy wheel printer, and might have to be changed to reflect your particular printer requirements. The REM statements in the other listings explain what most of the lines in the subroutine (10000 through 10110) do, so I won't elaborate on this listing any further.

Program Listing 2

For a Sanyo MBC-550/555 (or other computers with a BASIC GDCURSOR command), you can use this program to define an on-screen "box" which will contain the graphics or text that you wish to scan and send to the printer. This is very handy, as the GDCURSOR lines do not interfere with what is on the screen, but do allow you to select the area to print. Use this listing as a subroutine. Your main program will have to contain a GOSUB 63000 command.

Once you are operating in the subroutine, two lines will appear. Both lines can be controlled by pressing the arrow keys on the numeric keypad. The cursor lines normally increment by one pixel at a time, but this can be changed to 10-pixel jumps if you press the TAB key once. Pressing the TAB key again returns you to the one-pixel mode.

Position the GDCURSOR lines so that they intersect at the upper left corner of the "box" you want to define. The lines will show you where the left and top sides of the box are. Press the ENTER key once to store this position, then use the arrow keys to move the line intersection to the point on the screen that will correspond to the bottom right corner of your "box." Press ENTER once again and the program will scan and print what is inside the boundaries you have defined. After printing is completed, the RETURN in Line 63150 will send you back to the main program. The zero (0) in Line 63100 is the color code for black. This should be changed to match the color code of whatever you use for background color on the screen. The Sanyo MBC-550/555 computers use black (0) as the background color default.

As with the other listings, do not type in the REM lines. All important lines are incremented by 10 so that the AUTO line numbering function can be used.

Caution! Screen dumps using your daisy wheel printer *may* prematurely wear out your print wheel. While I have been using my Silver-Reed EXP-400 for several months for screen dumps, I am not sure how many times each leaf of the wheel can be hit by the hammer before it wears out. To dump the star figure (and the text with it), the hammer had to hit the daisy wheel leaf with the period 1,423 times. My *Silver-Reed Owner's Manual* did not give any clues as to how long I can expect to use this same print wheel, but if the condition of the wheel (I have examined it under a microscope) is any indication, I can expect to go on using it for a long time. To date, I have done about 30 screen dumps with it, each averaging about 2,000 hits. How many screen dumps *your* printer can stand will depend upon how dense the dump is, how often you will be using it for graphics and how well the wheel is made. Just check it often for any signs of unusual wear.

You can create some unusual effects by using different HMI and VMI values along with the use of some character other than a period. For example, try using an asterisk (*) or a plus sign (+) instead of a period in Line 63100 of Listing 2. Play with the HMI and VMI values until you hit upon a combination you like.



Figure 1: Output of Listing 1

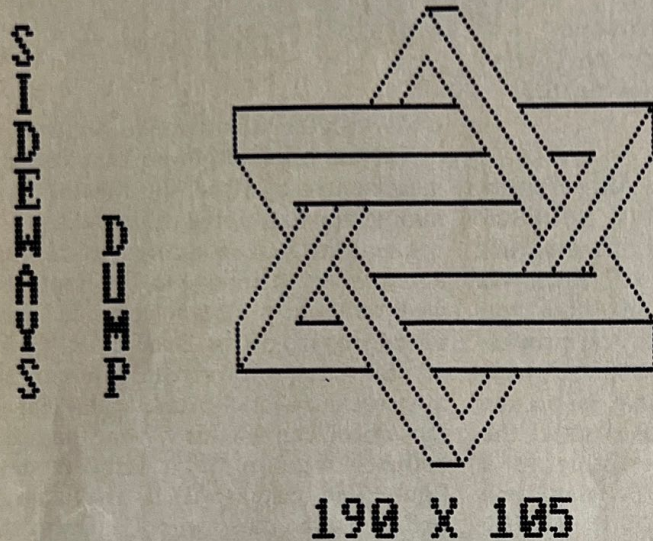


Figure 2: Sample Screen Dump

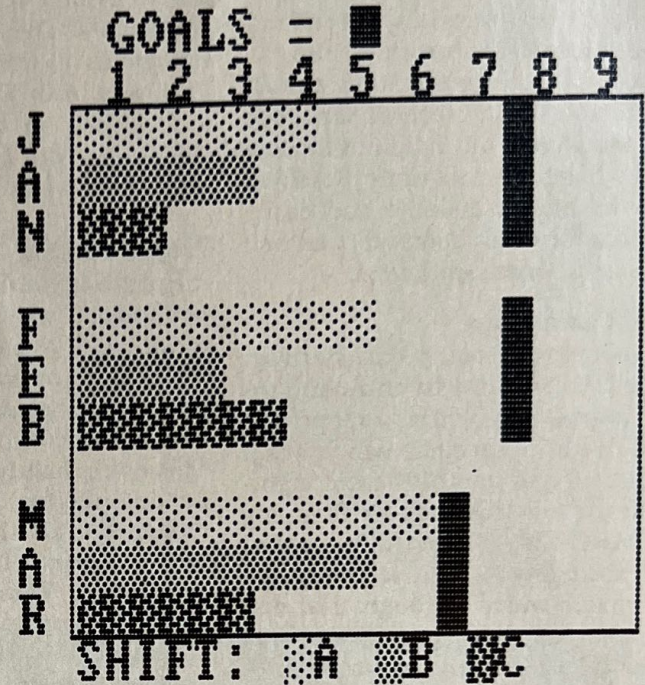


Figure 3: Example of Various Horizontal Motion Index Factors

An HMI of 5 did this.

This had an HMI of 4.

An HMI of 3 does this.

Listing 1: STARDUMP.BAS

```

5 TIMES="00:00:01"
10 CLS:LOCATE 3,1,0
15 PRINT "S":PRINT "I":PRINT "D":PRINT "E":PRINT "W D":PRINT "A U":PRINT "Y M"
  ":PRINT "S P"
16 PRINT :PRINT
20 FOR N=1 TO 36
30 READ X1,Y1,X2,Y2:Y1=Y1-10:Y2=Y2-10
40 LINE (X1,Y1)-(X2,Y2),3
50 NEXT N
60 DATA 112,24,120,24,112,24,146,58,120,24,150,54,112,24,96,40,104,40,112,32,112

```



```

,32,142,62
70 DATA 136,40,172,40,172,40,144,68,172,40,172,48,172,48,152,68,144,48,156,48,15
6,48,136,68
80 DATA 158,62,172,76,172,76,172,84,172,76,104,76,172,84,112,84,154,66,156,68,15
6,68,96,68
90 DATA 128,84,120,92,120,92,90,62,136,84,120,100,120,100,86,66,120,100,112,100,
112,100,82,70
100 DATA 88,76,76,76,76,76,96,56,96,84,60,84,60,84,88,56,60,84,60,76,60,76,80,56
110 DATA 120,40,60,40,60,40,60,48,60,48,128,48,60,48,74,62,78,58,76,56,76,56,136
,56
120 DATA 1,112,28,154,66,70,70,3,128.36,148,72,82,74,5,112,36,80,68,128,80
130 DATA 2,100,52,150,50,100,84,6,78,58,104,80,160,56,7,100,44,120,88,160,44
135 PRINT "          190 X 105"
136 PRINT :PRINT :PRINT
140 GOSUB 100000
145 PRINT TIMES$
150 STOP
100000 WIDTH 200
10010 LPRINT CHR$(27);CHR$(31);CHR$(5)
10020 LPRINT CHR$(27);CHR$(30);CHR$(2)
10030 FOR HORIZ=0 TO 190
10040 FOR VERTI=0 TO 105
10060 IF COLOR(HORIZ,VERTI)<>0 THEN C$="." ELSE C$=" "
10070 A$=C$+A$
10080 NEXT VERTI
10090 LPRINT A$:A$=""
10100 NEXT HORIZ
10110 RETURN

```

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Listing 2: GRAPHICS.BAS — Daisy wheel screen dump subroutine

```

62995 REM Puts X and Y cursor lines on screen, intersect at 300,100
63000 GCURSOR(300,100), (BX,BY)
63005 REM Defines upper left corner of screen print box
63010 FIRSTX=BX:FIRSTY=BY
63015 REM Puts X and Y cursor back on screen
63020 GCURSOR(BX,BY), (BX,BY)
63025 REM Defines for subprogram lower right corner of box
63030 SECONDX=BX:SECONDY=BY
63045 REM Sets printer line width
63050 WIDTH 200
63055 REM Sets HMI (1/120 inch X (n-1)), (n is 5 here)
63060 LPRINT CHR$(27);CHR$(31);CHR$(5)
63065 REM Sets VMI (1/48 inch X (n-1), (2 is minimum)
63070 LPRINT CHR$(27);CHR$(30);CHR$(2)
63075 REM Incremental movement on X axis
63080 FOR HORIZ=FIRSTX TO SECONDX
63085 REM Incremental movement on Y axis for building A$
63090 FOR VERTI=FIRSTY TO SECONDY
63095 REM Checks to see if color is black or not, assigns . or space to C$
63100 IF COLOR(HORIZ,VERTI)<>0 THEN C$="." ELSE C$=" "
63105 REM Builds A$ from C$ periods or spaces
63110 A$=C$+A$
63120 NEXT VERTI
63125 REM Prints A$
63130 LPRINT A$:A$=""
63140 NEXT HORIZ
65150 RETURN

```



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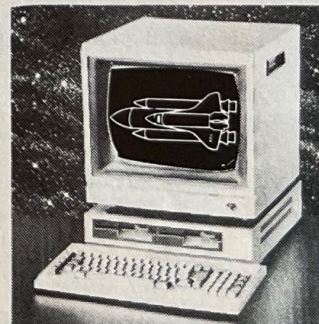
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ProDesign II requires an MBC-775 or a Video RAM Board and 512K. It is currently available for \$299, \$3 S/H from American Small Business Computers, 118 So. Mill Street, Pryor, OK 74361; (918) 825-4844.

E-Z-DOS-IT is a program which allows DOS to do more than one task at a time. You can run up to eight tasks at the same time depending on the size of your computer's memory and the memory requirements of the applications programs you select.

E-Z-DOS-IT requires a Video RAM Board or an MBC-775 and 256K. It is currently available for \$199.95 from Hammer Computer

Systems, Inc., 700 Larkspur Landing Circle, Suite 285, Larkspur, CA 94939; (415) 461-7633.

REFER is a program which helps save programmers time by processing any microcomputer language. As it reads your program, it prints a source code listing. This program also concurrently analyzes your program and prints a cross-reference of variables, values, keywords, line numbers and/or labels.

Refer can help you when you write, test, document and change programs. It comes with compiled code, source code and examples.

Refer is currently available for \$39 from James Halstead & Associates, 1551 Plainfield Road, Joliet, IL 60435; (815) 725-0346.

OPEN ACCESS is a software package that integrates a relational database, a spreadsheet, 3-D business graphics, word processing, time management and address file, telecommunications and conversion utilities for SIF, ASCII text and DBASE files.

Open Access is entirely menu driven. From the main menu you can enter any of the modules, access the program's utilities section or exit to the operating system. This program is also available in German, French,

Spanish, Dutch, Italian, Swedish, Norwegian, Finnish and Portuguese.

Open Access requires a Video RAM Board, an MBC-775 and 256K. It is currently available for \$695, \$3 S/H from Software Products International, 10240 Sorrento Valley Road, San Diego, CA 92121; (619) 450-1526.

BOOK SENSE. The *Sanyo BASIC User's Handbook* is a guide to Sanyo BASIC for the MBC-550/555 series computers. For beginners, this book offers step-by-step instructions in the use of Sanyo BASIC. For experienced programmers, there are discussions of graphics, file handling, machine language calls and I/O.

The *Sanyo BASIC User's Handbook* is currently available for \$17.95 from Weber Systems, Inc., 8437 Mayfield Road, Chesterland, OH 44026; (216) 729-2858.

SANYGRAF is a business and scientific graphics package. It will transform numerical reports from your spreadsheet, database or application programs to understandable line graphs, and bar or pie charts of your data in full color.

SanyGraf requires MS-DOS 2.11 and at least 256K. It is currently available for \$99 from A-OK Computers, 816 Easley St., Suite 615, Silver Spring, MD 20910; (301) 585-5105.

The products and services listed above are currently available for Sanyo personal computers and many will be reviewed in future issues of *SOFT SECTOR*.

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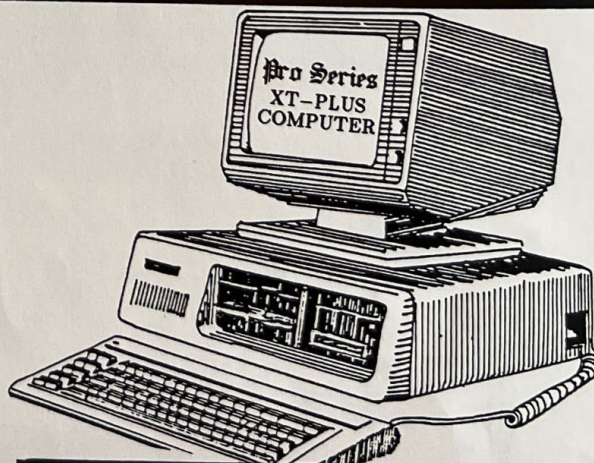
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★★★★★

BLUE STAR

This program will begin by clearing the screen and then draw a star using a line design technique. When you type in this program you should type it in exactly as it is written so you will be sure to get it all in on one line. I am 13 years old and I have been enjoying my Sanyo since Christmas.

```
1 CLS:FOR X=300 TO 480 STEP 10:LINE(300,Y)-(X,90):Y=Y+5:NEXT:FOR X=470 TO 300 STEP-10:LINE(300,Y)-(X,90):Y=Y+5:NEXT:FOR X=290 TO 130 STEP-10:LINE(300,Y-10)-(X,90):Y=Y-5:NEXT:FOR X=120 TO 290 STEP 10:LINE(300,Y-10)-(X,90):Y=Y-5:NEXT:FOR T=1 TO X*50:NEXT
```

Kyle C. Quinnell
Las Cruces, NM

★★★★★

SLOT MACHINE

This program asks you if you want to play. It then clears the screen, draws the slot machine and gives your first selection. It even congratulates you when you win!

```
1 INPUT "PLAY";A$:IF A$="N" THEN END ELSE CLS:FOR P=1 TO 3:LINE(99-P,40-P)-(465+P,135+P),P,B:D(P)=INT(RN D*3+1):SYMBOL(P*99+P*25,50),CHR$(D(P)),9,9:NEXT:IF D(1)<>D(2) OR D(1)<>D(3) THEN 1 ELSE FOR S=1 TO 7:CLS:BEEP:SYMBOL(70,50),"BRAVO !",S,8:BEEP:NEXT
```

Yvan Fortin
Montreal PQ Canada

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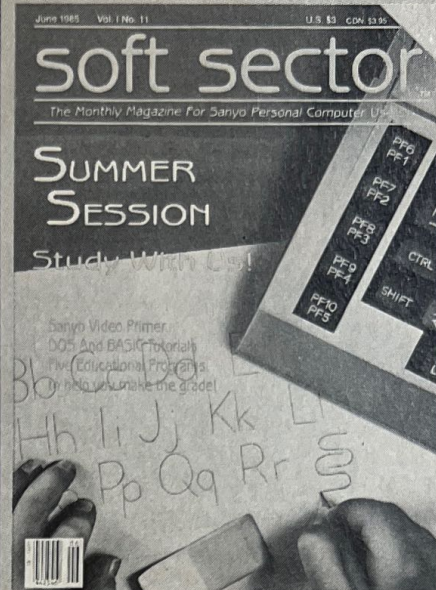
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BUSINESS SECTOR

CHARLOTTE & BRIAN STONE
 Soft Sector Contributing Editors

Q. I have a Tandy DMP-105 printer that I would like to use with my Sanyo MBC-555. Can you furnish any information on how to install the printer with the software that comes with the computer? Also, I get a second linefeed every time. Can this printer do graphics?

William F. Steagall, Sr.
 Santa Monica, CA

A. After studying the manual pages sent with your second letter, I think the following will help with using your DMP-105 with WordStar.

Reinstall a copy of WordStar for a "Standard Printer," from the printer menu. After you have done the installation, change the printer initialization to the following Hex codes

SUBMITTING MATERIAL

Contributions to SOFT SECTOR are welcome from everyone. We like to run a variety of programs which will be useful/helpful/fun for other Sanyo owners.

• **FORMAT:** Unless the program accompanying your submission is less than 10 lines, we must have the program itself on disk. We will print out the listing to our specifications. We simply cannot take the time to key in (and debug our typing errors) material which is longer than that. Editorial copy can also be included on disk, using any of the word processors currently available for the Sanyo 550, 555 or 775. However, please also include a double-spaced hard copy of your editorial material and hard copy of your program listing. Please do not send text in all capitals. Use upper- and lowercase. While it is a big help to us in typesetting for you to send your article saved on disk using the ASCII option, it is not mandatory. But we must have, at the very least, a double-spaced hard copy of the article.

• **WHAT TO WRITE:** Anything with a practical application. If it interests you, it will probably interest a lot of others. However, we vastly prefer articles with accompanying programs which can be entered and run. The more unique the idea, the more appeal. We can prepare finished tables, diagrams and schematics from your rough draft if you provide legible copy and full directions. We have a continuing need for short articles with short listings.

We do pay for submissions, based on a number of criteria. Those wishing remuneration should so state when making submissions.

For the benefit of those who wish more detailed information on making submissions, please send an SASE to: Submissions Editor, SOFT SECTOR, P.O. Box 385, Prospect, KY 40059. We will send you some more comprehensive guidelines.

Please do not submit programs or articles currently submitted to another publication.

(Charlotte Stone, office manager for the Detroit office of the Shaw/Walker Co., has been using a Sanyo computer in her daily work routine since October of 1983. Brian Stone has been using a variety of Sanyo computers since May of 1983. Charlotte and her husband, Brian, have been involved with computers since July of 1978 and presently own and use five computer systems on a daily basis, three of which are Sanyos.)

— 1Bh and 15h. This will hopefully tell the printer *not* to send a linefeed with a carriage return. This is what *WordStar* expects the printer to do and this is why you are getting the double-spaced text.

I do not know how to help you generate graphics with the printer because it is designed to generate TRS-80 graphics rather than Epson-style graphics, which most software will try to do. I hope this is of some help for your *WordStar* use.

Q. Can you tell me if a Sanyo MBC-555 with the Video RAM Board will run the screen editor of *dBase II*?

George F. Jenkins
Bloomington, MN

A. I have checked with one of my sources and he thinks *dBase II* should run without modification on a machine with the Video RAM Board.

Q. I would like to insert accent marks when entering data with *InfoStar* and would like to print more than one copy of a file with *WordStar*. I don't want to merge anything. How do I do these things?

Mickey Raymer
Ava, MO

A. In regard to using *MailMerge*, just answer the questions like you would if you were just printing a letter with the 'P' option. The prompt "Name of file to merge" is just asking for the filename of what you want to print. You will finally get to the question "How many copies to print?"

From what we can find, you will not be able to insert accent marks in the variables when using *InfoStar*. Most of the *WordStar* controls can be used to emphasize report headings but not data which you will input.

Q. I have a TI-855 dot matrix printer and would like to use it with *WordStar* but do not know how to install it because it is not on the menu.

Pat Callahan
La Crosse, WI

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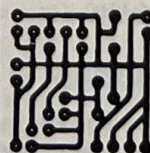
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A. I am sorry to have taken so long to respond to your letter. One reason for the delay is because I had trouble finding out anything about your printer.

I have found that your printer is supposed to emulate an Epson in draft mode and a Diablo in letter-quality mode. The printer probably defaults to TI codes and must be toggled to get the other two modes. Have you tried this?

Try installing *WordStar* as the Epson choice from the printer install menu and see what it will do, then install another copy as the Diablo 630, then the 1610 and see which of these works best with your printer.

Q. I would like to find a patch to CalcStar to allow the use of all 128K of memory for the spreadsheet without upgrading my RAM. I have been told by Sanyo that without the memory upgrade I can expect only about 7K of memory.

David E. Ritter
Pottstown, PA

A. There is no patch to allow *CalcStar* to use all of the 128K of memory in a 128K computer. The operating system uses about 30K of the RAM and the program itself is a little smaller than 54K. If we take a look at some of the figures involved, you will see why your spreadsheets are so small.

128K machine = 131,072 bytes of RAM
without DOS
loaded.

128K machine = 77,888 bytes of RAM
with DOS 2.11
and system uses.

Subtract *CalcStar* 54,000
RAM available for spreadsheet 23,888 You must also
subtract room for
the overlays.

Q. I would like to run Lotus 1-2-3, MultiMate and Personal Editor on my MBC-550. What hardware or software considerations should be observed?

George E. Orient
Los Angeles, CA

A. The only way to get the Sanyo MBC-550 series to closely emulate the IBM PC is to have the Video RAM Board installed. This will guarantee that *Lotus 1-2-3* will run, but I do not know for sure if *MultiMate* or *Personal Editor* will also run.

Your dealer will be able to get the Video RAM Board. It retails for \$150 and can be installed by the user. A new version of MS-DOS and a version of GW-BASIC is included.

Q. I would like to find an idea processor or an outliner for the Sanyo MBC-550. Are there any on the the market

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and are they compatible? Also, how do I determine compatibility of IBM programs for use with MS-DOS 2.11?

Rev. William B. Curtin, OP
San Francisco, CA

A. The only idea processor that I am aware of and which may work, is a program called *Think Tank* for the IBM PC. The reason I say may work is because I think that it is copy protected and thus may not be able to be copied to the Sanyo MS-DOS. Some copy protected software must boot and an IBM version will not do so in the MBC-550 series.

Regarding the compatibility of programs for the Sanyo, there is never a guarantee that IBM software will run. It is not the DOS which is not compatible; it is the hardware (the computer itself). The only way to get greater odds on your side is to have the Video RAM Board installed in the machine. This *does not* guarantee total compatibility because you still will not have an IBM, but it does allow more programs to function.

Q. How can I get my Telex Daisy Printer to do super- and subscript? It seems that I would have to install WordStar for a different printer but I do not know what choice to make from the menu.

Michael Doeff
El Cerrito, CA

A. I am not sure which daisy wheel printer your Telex Daisy Printer emulates, but you could install a copy of *WordStar* for the Diablo 1610 and 630 printers to see if one of those drivers will work correctly. According to the copy of the manual that you sent, your printer will super- and subscript. If one of the Diablo selections does not work, your only choice is to try each of the daisy wheel choices on the menu until you find one that works. My best guess is the Diablo because most manufacturers use those codes.



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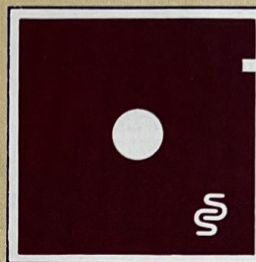
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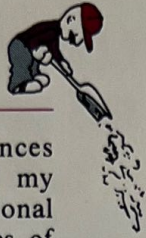
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There are enough differences between an IBM PC and my Sanyo to give me an occasional dose of envy. One of the features of "Big Blue" that I often wished I had was a character screen dump.

There are a couple of ways to get around this. The Sanyo allows you to press CONTROL-P and echo the screen output to the printer. There are times, however, when I don't know that I want something printed until I see it on the screen.

Sanyo does provide a graphics screen dump that I could use, but that solution is slow, incomplete and not really what I want. The unaltered Epson graphics screen dump prints only 480 of the 640 horizontal pixels on the eight-inch carriage of my Panasonic 1091. I could patch the program's assembly language source code so that it prints 640 columns on my printer (in fact, I have done so), but this process is still slower, harder on the print head and ribbon, and less "businesslike" than an ordinary character screen dump program would be.

So, I decided to write my own screen dump program. There are commercial screen dump programs available, but one of the reasons I bought a Sanyo is that I hate to spend money. Plus, I like the adventure of exploring the inner workings of my computer. I have never before programmed in assembly language, so this program is testimony to what a determined user can do with a little help.

Operating Instructions

For those who don't have access to an assembler, or who don't care about learning assembly language, the BASIC program listed below will produce the ASCII-SD.COM file. Those who assemble and link the program should also

(Mitchell Lewis is an ordained elder in the United Methodist Church. He purchased his Sanyo MBC-555 to use in his ministry and he assists congregations and other units of the church with their computer setups and operations. Mitchell can be contacted c/o the New Pentecost United Methodist Church, Route 4, Box 122, Winder, GA 30680.)



run EXE2BIN. The program will not work properly as an .EXE file.

The .COM file installs the screen dump program in memory. It is then activated by pressing CONTROL-SHIFT-' (the large key to the left of the RETURN key). Each screen print will require 33 lines, or one-half of an ordinary page.

It should be noted that the .COM program must be run each time the computer is turned on or reset, in order for the screen dump to be present. The converse is also true. The program need only be run once each session. Once the code is installed in memory, it stays there until you turn the power off or press Reset. If you always want the screen dump installed, this can be accomplished automatically with an AUTOEXEC.BAT file.

No harm is done if you try to install the program more than once. The screen dump routine can also be called from a user program by calling INT 05. Those interested in how it works should read on.

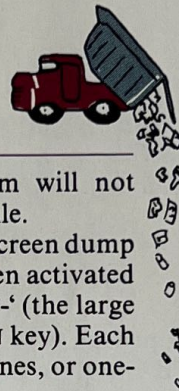
It was SOFT SECTOR that gave the clues I needed to write the program. In the February 1985 issue, Page 86, Tim Purves mentioned that Function 71h of Interrupt 10h returned a pointer to the character RAM. That was an essential clue. Richard Kruse's article (SOFT SECTOR, June 1985, Page 10) on the organization of the Sanyo's video RAM also provided essential information. The Sanyo video system keeps in memory, a read-only copy of the character screen. This portion of RAM is 4,000 bytes long. Within these 4,000

Down In The

ASCII Screen

Sanyo ME

By Rev. M



bytes, the characters are arranged sequentially from first column to last column, and from first line to last line. Each character is represented by two bytes. The first byte represents the ASCII code of the character, and the second byte represents its video attribute (color or intensity). Finally, Larry Forman's letter in SOFT SECTOR (June 1985, Page 70) gave me some hints about how the print screen routine works in the IBM PC and the Sanyo Video RAM Board versions of DOS.

I studied this information, along with the technical reference section of the *Sanyo Operator's Guide* and a couple of books on IBM PC assembly language programming, and here's what I came up with. The program works much like the Epson graphics dump provided by Sanyo.

le Dumps

een Dump

r

C 550/555

chell Lewis



When any key is pressed, the 8259 Interrupt Controller alerts the 8088 microprocessor of that fact. The 8088 then temporarily stops what it is doing to process the data from the keyboard. It does this by calling Interrupt 251 (FB Hex).

The processor looks for the address of all interrupt service routines in Segment 0000 at an offset of four times the number of the interrupt. In our case, the segment and offset of the routine which process the keyboard input are located in segment 0000 at an offset of $4 * 251$ (or 1004). These addresses of the interrupt service routines are known as "vectors."

The program begins by patching the interrupt vectors. It patches the vector of the the original keyboard service routine into an ordinarily unused

interrupt — number 247 (F7 Hex). It then causes the vector of Interrupt 251 to point to the program's own keyboard service routine.

Finally, the program patches the vector of the actual screen dump routine into the address for Interrupt 5. Interrupt 5 is unused in the bundled version of MS-DOS, but points to a screen dump routine in PC-DOS and Sanyo's MS-DOS 2.11 VB. Since the vector at INT 5 now points to our screen dump routine, we can call it from user programs without requiring keyboard input. Programs that utilize this feature should no longer result in an "Interrupt Trap Halt" with the bundled version of the Sanyo DOS.

After the patches are complete, the program returns control to DOS. The working portions of the program (the screen dump routine and the keyboard service routine) remain in memory, while the memory used for the installation code is released for other programs.

Now, when a key is pressed, the computer jumps to the portion of code labeled INT_FB. The code first does the normal keyboard service routine (now INT F7 Hex) and then checks to see if the key pressed was CONTROL-SHIFT-'. If so, the program calls Interrupt 5 (the screen dump) and clears the keyboard buffer when finished.

The screen dump itself works in this order:

1) Save the contents of the 8088's registers.

2) Disable the keyboard from causing another interrupt while the screen dump is in progress. This is done by masking out the IR3 pin of the 8259 Interrupt Controller. Page 5-18 of the *Sanyo Operator's Guide* tells what each of the eight pins of 8259 is used for. The byte at I/O Port 02 indicates whether the 8259 is allowed to forward the interrupt request or not. Each bit represents a pin on the 8259. The program fetches the current mask from Port 02, forces the 8's bit to one (xxxxlxxx), and sends that byte back out to Port 02.

3) Find the address of the character screen memory. Tim Purves showed us how to use BIOS call 10 Hex to fetch the address of the character screen memory. We use the ES segment to refer to the character screen segment, and the SI register to point to the offset of the first byte of the character screen memory.

4) Print the 25 lines of the screen, followed by eight blank lines. This makes a total of 33 lines, or one-half of a normal page. Notice that these routines use loops. The CX register is the loop counter. Before executing the loop, CX is set to the desired number. When the LOOP command is encountered, CX is decremented by one and control passes back to the address indicated by the following label. This portion of the program makes use of sub-routines labeled PRT1LN, DOSPRN and LNFEED. PRT1LN saves the line count, prints 80 characters and restores the line count. The character to be printed is located at the address ES:SI. These are the registers we first set when we fetched the address of the character screen. Each time a character is printed, SI is incremented by two. This skips over the attribute byte associated with the character just printed and makes SI point to the next character. DOSPRN uses the BIOS routine 17 Hex, described on Page 5-21 of the *Sanyo Operator's Guide*.

5) Clear the keyboard buffer of all keys pressed during the screen dump. The program does this by reading the keyboard input port on the 8088. Page 5-27 of the *Sanyo Operator's*

Guide gives the address of these ports; 38 Hex for data and 3A Hex for Command/Status. The keyboard I/O is done with an 8251 USART, just like the one that controls serial I/O through the RS-232C. Page 5-30 of the *Sanyo Operator's Guide* that shows the second bit from the right (the 2's bit) indicates the presence of data to be processed. The CLRBUF routine gets the contents of the Command/Status port (3A Hex) and checks to see if the 2's bit is high. If it is, the



routine reads in a character from port 38 Hex and sends an error reset to the USART in case the CONTROL key is pressed. The Sanyo CONTROL key causes the keyboard data to be sent with a parity error (*Sanyo*

Operator's Guide Page 5-32). I don't really know the size of the keyboard buffer so I just loop until it is empty.

- 6) Allow the 8259 to pass along keyboard interrupts once again by forcing the 8's bit of the interrupt mask to zero.
- 7) Restore the registers to their original contents.
- 8) Return to the calling program.

I've learned a lot from SOFT SECTOR. I hope this program is both educational and useful for you.

Listing 1: ASCII-SD.BAS

```
100 DATA E9,87,00,FA,50,53,51,52,56,06,1E,0E,1F,E4,02,0C,08,E6,02,FB
110 DATA B4,71,CD,10,1E,8E,D8,8E,07,8B,D9,8B,37,1F,B9,19,00,E8,27,00
120 DATA E2,FB,B9,08,00,E8,3B,00,E2,FB,FA,E4,3A,A8,02,74,08,E4,38,B0
130 DATA 35,E6,3A,EB,F2,E4,02,24,F7,E6,02,1F,07,5E,5A,59,5B,58,CF,51
140 DATA B9,50,00,26,8A,04,E8,0A,00,83,C6,02,E2,F5,E8,0A,00,59,C3,B4
150 DATA 00,BA,00,00,CD,17,C3,B0,0D,E8,F3,FF,B0,0A,E8,EE,FF,C3,CD,F7
160 DATA 50,B4,01,CD,16,3D,1E,07,75,06,CD,05,B4,00,CD,16,58,CF,FA,33
170 DATA C0,8E,C0,26,A1,EC,03,3D,76,01,74,2A,26,A3,DC,03,26,A1,EE,03
180 DATA 26,A3,DE,02,B8,76,01,26,A3,EC,03,26,8C,0E,EE,03,B8,03,01,26
190 DATA A3,14,00,26,8C,0E,16,00,BA,8B,01,FB,CD,27,B4,00,CD,21
200 CLS
210 PRINT "Creating ASCII Screen Dump 'ASCII-SD.COM'. Please Stand by"
220 OPEN "O",#1,"ASCII-SD.COM"
230 FOR I%=1 TO 198
240 READ A$
250 PRINT #1;CHR$(VAL("&H"+A$));
260 PRINT ".";
270 NEXT I%
280 CLOSE #1
290 PRINT:PRINT "ASCII Screen Dump 'ASCII-SD.COM' has been created"
```

Listing 2: The assembly language source code

```
TITLE    ASCII SCREEN DUMP FOR SANYO MBC-550/555
CSEG     SEGMENT
          ORG      1000H
          ASSUME   CS:CSEG, DS:CSEG
START:   JMP      INIT

INT_05:  CLI
          PUSH     AX                ;SAVE REGISTERS
          PUSH     BX
          PUSH     CX
          PUSH     DX
          PUSH     SI
          PUSH     ES
          PUSH     DS
          PUSH     CS                ;SET DS := CS
          POP      DS

          IN       AL,2              ;GET 8259 INTERRUPT MASK
          OR       AL,8              ;MASK OUT KEYBOARD (IR3)
```


OUT 2,AL
STI

MOV AH,71H ;GET POINTER TO CHARACTER SCREEN
INT 10H
PUSH DS
MOV DS,AX
MOV ES,[BX]
MOV BX,CX
MOV SI,[BX]
POP DS

MOV CX,25 ;SET COUNTER TO 25 LINES
NEXTLN: CALL PRT1LN ;PRINT ONE LINE
LOOP NEXTLN
MOV CX,8 ;SET COUNTER TO 8 LINES
NEXTLF: CALL LNFEED ;ISSUE LINE FEED
LOOP NEXTLF ;(MAKES EVEN 1/2 PAGE)
CLI

CLRBUF: IN AL,3AH ;CLEAR KEYBOARD BUFFER
TEST AL,2 ;OF ALL INPUT
JZ KEYSON
IN AL,38H
MOV AL,35H
OUT 3AH,AL
JMP CLRBUF

KEYSON: IN AL,2 ;RE-ENABLE KEYBOARD
AND AL,0F7H ;UN-MASK INTERRUPT IR3
OUT 2,AL

POP DS ;RESTORE REGISTERS
POP ES
POP SI
POP DX
POP CX
POP BX
POP AX
IRET ;RETURN FROM INT 05 CALL

PRT1LN: PUSH CX ;SAVE COUNT OF LINE NUMBER
MOV CX,80 ;SET COUNTER TO 80 COLUMNS
NEXTCH: MOV AL,ES:[SI]
CALL DOSPRN ;PRINT ONE CHARACTER
ADD SI,2 ;INCREMENT INDEX
LOOP NEXTCH
CALL LNFEED ;ISSUE LINE-FEED WHEN DONE
POP CX ;RESTORE LINE NUMBER TO CX
RET

DOSPRN: MOV AH,0 ;BIOS PRINTER ROUTINE
MOV DX,0 ;SEE SANYO USERS MANUAL
INT 17H
RET

LNFEED: MOV AL,0DH ;CARRIAGE RETURN
CALL DOSPRN
MOV AL,0AH ;LINE-FEED

CALL	DOSPRN	
RET		
INT_FB: INT	247	
PUSH	AX	;FIRST DO NORMAL KEYBOARD INT
MOV	AH,1	
INT	16H	;LOOK AT CHARACTER IN BUFFER
CMP	AX,071EH	
JNE	GO_ON	;THE CTRL-SHIFT-` CHARACTER?
INT	5H	
MOV	AH,0	;DO SCREEN DUMP
INT	16H	
GO_ON: POP	AX	;CLEAR KEYBOARD BUFFER
IRET		
		;RETURN FROM INT FB CALL
INIT: CLI		
XOR	AX,AX	
MOV	ES,AX	;PATCH OLD INT FB VECTOR
MOV	AX,ES:[0FBH*4]	;INTO INTO UNUSED VECTOR
CMP	AX,OFFSET INT_FB	;OF INT F7
JE	ABORT	
MOV	ES:[0F7H*4],AX	;ABORT IF ALREADY INSTALLED
MOV	AX,ES:[0FBH*4+2]	
MOV	ES:[0F7H*4+2],AX	
MOV	AX,OFFSET INT_FB	
MOV	ES:[0FBH*4],AX	;PATCH THE ADDRESS OF THIS
MOV	ES:[0FBH*4+2],CS	;PROGRAM'S KEYBOARD ROUTINE
		;INTO THE VECTOR AT INT FB
MOV	AX,OFFSET INT_05	
MOV	ES:[05H*4],AX	;PATCH ADDRESS OF SCREENDUMP
MOV	ES:[05H*4+2],CS	;ROUTINE INTO UNUSED VECTOR
		;OF INT 05
MOV	DX,OFFSET INIT+1	
STI		;EXIT AND STAY RESIDENT
INT	27H	;RELEASE UNNEEDED MEMORY
		;FROM THIS PROGRAM
ABORT: MOV	AH,0	
INT	21H	;JUMP HERE IF ALREADY INSTALLED
CSEG	ENDS	
	END	START

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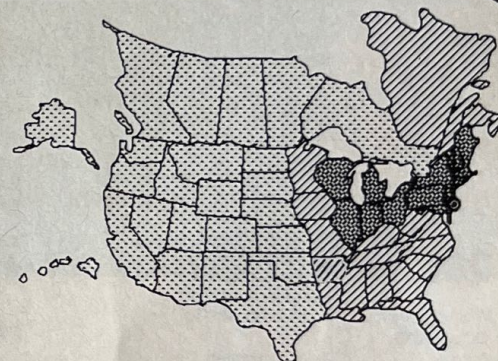
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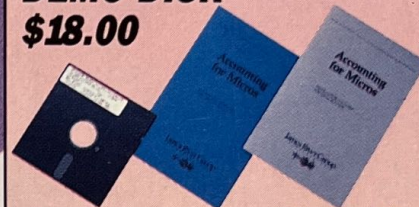
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